BUREAU OF FISHERIES

REPORT OF

THE COMMISSIONER OF FISHERIES FOR THE FISCAL YEAR 1908

AND

SPECIAL PAPERS

GEORGE M. BOWERS
Commissioner

WASHINGTON
GOVERNMENT PRINTING OFFICE
1910

CONTENTS.

REPORT OF THE COMMISSIONER OF FISHERIES FOR THE FISCAL YEAR ENDED JUNE 30, 1908

Bureau of Fisheries Document No. 642

CONTENTS.

REPORT

OF THE

COMMISSIONER OF FISHERIES.

DEPARTMENT OF COMMERCE AND LABOR,
BUREAU OF FISHERIES,
Washington, December 1, 1908.

SIR: I have the honor to submit herewith a report of the operations of the Bureau of Fisheries for the fiscal year ended June 30, 1908.

PROPAGATION AND DISTRIBUTION OF FOOD FISHES.

OUTPUT.

The fish-cultural efforts of the Bureau in 1908 were directed chiefly to increasing the collection of eggs and the output of young fish. The possibilities of expansion and development in nearly every line are almost unlimited—depending largely on the funds and trained men available for opening up new fields—but the public need and popular demand seem best subserved under the present circumstances by the concentration of efforts for immediate results in quantity in the fields already occupied. Thus, with the same funds as during the previous year, the hatcheries in 1908 yielded 376,000,000 fish more than in any other year, and delivered about 458,000,000 eggs to State and foreign hatcheries. The total output was over 2,871,000,000 eggs and fish, of which over 2,400,000,000 were fish.

The conspicuous increases were in whitefish; silver, blueback, and humpback salmons, rainbow and brook trouts, large-mouth and small-mouth black basses, yellow perch and white perch, cod, flatfish, and lobsters, all of which were produced in greater quantities than ever before. There was likewise an increase in shad, due largely to improved conditions in the Albemarle region of North Carolina. The output of lake trout and pike perch fell behind the 1907 record, as did also that of chinook salmon and Atlantic salmon. Fluctuations in the production of many of the fishes handled are, however, inevitable, being due to weather and other conditions which can not be controlled.

Following is a table summarizing the distributions of fish and fish eggs during the past year. Of these distributions 440,161,000 eggs, 4,975,000 fry, and 49,800 older fish were delivered to various state fish commissions, and 3,997,725 eggs (salmon and trout) were shipped to foreign countries. On Lake Erie the Ohio and Pennsylvania fishery authorities cooperated with the Bureau in the collection of whitefish, lake-cisco, and pike-perch eggs.

SUMMARY OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR ENDED JUNE 30, 1908.

Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Catfish			277,601	277,601
Carp			350	350
Buffalofish			40,500	40,500
Shad	760,000	79,316,600		80,076,600
Whitefish	139,266,000	384,480,000		523,746,000
Lake cisco	12,790,000	3,200,000		15,990,000
Chinook salmon	68,385,550	24,998,185	2,231,797	95,615,532
Silver salmon	296,000	13,420,714	57,932	13,774,646
Blueback salmon	75,000	69,883,305		69,958,305
Humpback salmon		7,185,748		7,185,748
Steelhead trout	333,725	1,123,146	59,000	1,515,871
Rainbow trout	830,000	253,650	2,713,600	3,797,250
Atlantic salmon		2,079,514	30,003	2,109,517
Landlocked salmon	190,000	441,281	151,526	782,807
Blackspotted trout	768,380	4,230,540	1,442,376	6,441,296
Loch Leven trout			55,012	55,012
Lake trout	2,734,000	25,267,078	3,182,080	31,183,158
Brook trout	1,473,400	6,307,048	3,471,292	11,251,740
Sunapee trout		191,736		191,736
Grayling	200,000	1,047,000		1,247,000
Pike			17,550	17,550
Crappie and strawberry bass			200,268	200,268
Rock bass			25,090	25,090
Warmouth bass			1,638	1,638
Small-mouth black bass		232,312	78,940	311,252
Large-mouth black bass		23,900	588,047	611,947
Bream or sunfish			202,810	202,810
Pike perch	218,725,000	193,438,000		412,163,000
Yellow perch	2,080,000	382,576,000	68,045	384,724,045
Striped bass		4,333,500		4,333,500
White perch	5,740,000	321,670,000		327,410,000
White bass			500	500
Fresh-water drum			26,000	26,000
Cod	3,000,000	235,365,000		238,365,000
Flatfish		389,642,000		389,642,000
Pollock		66,454,000		66,454,000
Tautog		794,000		794,000
Lobster		180,932,000	1,011	180,933,011
Total	457,647,055	2,398,886,257	14,922,968	2,871,456,280

Large as are the foregoing figures, they in no case exceed the actual need and in most instances fall far short of the requirements. The extent of the fisheries, the vast area and number of the waters to be stocked, and the results of overfishing and changed physical conditions, together with inadequate protection in many States, make imperative the most active prosecution of this work and its rapid expansion to meet special conditions.

A very large percentage of the fishes handled by the Bureau are deposited in public waters in accordance with the apparent demands and in response to the recommendations of those in charge of the various hatcheries. There is, however, a steadily increasing demand for certain kinds of fish to plant in the interior waters, both private and public, which indicates a growing popular interest in fish-culture and a more widespread appreciation of the great benefits that come from the utilization of small waters for the raising of food and game fishes. In 1908 the number of applications for such purposes reached 8,284, against 6,346 in 1907—the greatest increase so far recorded.

NOTES ON CERTAIN OPERATIONS.

New features of the work.—The hatchery work in 1908, although so largely concentrated upon increasing the output, was not without new features. The yellow bass (*Morone interrupta*), prized as a

game and food fish in the Gulf States and the Middle West, was added to the list of species propagated; and in response to a growing and insistent demand there were distributed in several instances a brood stock of carp, which fish the Bureau has not been distributing for many years. Some waters not suited to any other species are suited to carp, and the purpose of the Bureau to supply this fish for such waters, preferably by transfer from other waters, should not provoke the criticism justly addressed to carp misplaced.

The collection of cod eggs by the Norwegian method, introduced about two years ago, has proved so satisfactory that it has superseded the former method as far as equipment permits, and will in time be generally adopted. The essential feature of the Norwegian method is that the brood cod are kept in suitable inclosures and allowed to spawn naturally, their eggs coming to the surface and being collected automatically. This is a much less expensive and more efficient way to obtain the eggs than was formerly practiced.

To increase the effectiveness of the Bureau's distribution of fish and at the same time to facilitate the office work, there has been established a card-index system by which will be preserved all obtainable data pertaining to plants of fish in the many thousands of ponds, lakes, and streams that the Bureau has stocked. This information will afford a complete fish-cultural history of the respective waters, and will be invaluable as a guide in the allotment of fish on application, showing readily what species are indigenous, what species have been successfully introduced or have failed to survive, and what species, by their habits or the habits of the fish already in the waters, would be an unsuitable addition.

Rescue of fishes from overflows.—The collection of fishes from overflowed lands of the Mississippi Valley was successfully conducted this year, but with increasing evidence of the need of more stations. These collections are at present depended upon to supply desirable pond and stream fishes to many applicants throughout all the Middle West and the South, and there is much greater demand than can be met. The deficiency, however, is not in the lack of obtainable fish, for millions are left to waste. By reason of the remoteness of many of the waters for which the fish are desired, it is impossible for the Bureau's cars and messengers to accomplish the necessary travel within the collecting season; and in the absence of convenient or adequate storage ponds none of the fish can be held for later distribution. It is most important for this work that there be established along the upper Mississippi stations with large pond capacity for the retention of rescued fish.

As a source of general supply for applicants, however, the overflow collections are necessarily unreliable. The flood seasons are variable and the periods of collecting consequently uncertain. In the interest of economy and efficiency, it is essential that the more remote regions shall be provided with hatcheries, which will furnish the desired fish to applicants in those respective localities, leaving the fishes collected from the overflowed districts to be distributed near by.

Culture of striped bass.—The hatching of striped bass continues to be unsatisfactory, and the persistent difficulties that the Bureau has encountered point to the possibility that artificial propagation of this species upon any adequate scale may never be feasible, at least on the Atlantic coast. A removable adversity, however, is the ex-

cessive fishing at the mouths and in the lower waters of streams, which prevents so large a proportion of the fish from reaching the spawning grounds, thus curtailing the Bureau's hatchery work as well as interfering with natural reproduction; and this condition, coupled with the doubtful practicability of artificial propagation in any case, leads to the conclusion that in the Atlantic Coast States the need of the striped bass is protective legislation. It may be said, indeed, that the future of this fishery is largely dependent upon the protection accorded the spawning fish.

Acclimatization of the lobster on the Pacific coast.—Efforts to establish the eastern lobster on the Pacific coast of the United States have been continued, and much the largest plant of adult lobsters ever attempted has been made in the waters of Puget Sound. In November, 1907, a carload lot of lobsters in charge of a special attendant was taken from the Atlantic coast to Seattle, the lobsters packed in wet seaweed, held in shallow trays, and kept at a low temperature en route. There was only a small loss in transit, and 1,011 fully grown lobsters, 470 being egg-bearing, were safely deposited on suitable bottom about the San Juan Islands.

Some results of fish-culture.—Results of the propagation of whitefish in the Great Lakes, particularly in Lake Erie, have been unmistakably evident during the past year, and the commercial fishermen unanimously credit the abundance of fish to the work of the hatcheries; the catch during 1907 and the first half of 1908 was larger than in any equal period for fully twenty years. The numerous and long unrewarded attempts to acclimatize the chinook salmon in New England waters have borne their first noteworthy fruit in Sunapee Lake, New Hampshire, where many of these fish have recently been captured and identified. Whether this valuable species will succeed in establishing itself in this lake remains to be seen. Fishermen all along the New England coast report a remarkable increase in the abundance of lobsters; this is shown by a larger catch and a reduction in the price paid by consumers, and is believed to be the outcome of the largely increased plants of fry during the past few years.

SCIENTIFIC INQUIRY.

PEARL-MUSSEL INVESTIGATIONS.

An important biological investigation during the past year has been addressed to the distribution and habits of pearly mussels in the Mississippi Valley and to experiments in mussel culture. The pearl-button industry of the United States has an invested capital of $2,000,000 and produces an annual output valued at about $6,000,000, but the supply of fresh-water mussels which constitute its raw material is becoming rapidly exhausted, and the industry will eventually cease to exist unless relief is afforded. The Bureau is now endeavoring to locate all possible sources of supply and to determine the extent of the depletion which has occurred, is making studies of the habits of the mussel in order to recommend necessary regulation of the fishery, and is experimenting in artificial propagation. The culture experiments have been successful almost from the beginning, and the work is even now being conducted on a scale promising practical results. Congress, moreover, at the solicitation of the pearl-button interests and

on the recommendation of the Bureau, has provided for a station where mussel culture can be conducted on a scale commensurate with the requirements, and it is hoped to have this in operation during the ensuing year. The methods of mussel culture are such that they are applicable to large streams and lakes as a function of the Government, or to smaller inclosed bodies of water under private enterprise. They can also be conducted with little additional expense in connection with the rescue of fish from overflowed lands, which already constitutes an important work of the Bureau in the Mississippi Valley.

OYSTER WORK AND EXPERIMENTS.

Louisiana oyster work.—The experiments in Louisiana undertaken at the request of the Louisiana Oyster Commission have been attended with the most gratifying success and appreciation of the economic aspects of the work. The experimental beds in Barataria Bay, where there has been no oyster industry heretofore, have yielded at the extraordinary rate of from 1,500 to 2,000 bushels of marketable oysters per acre at the end of two years from the time the cultch was deposited on barren bottom. Practically all available bottom surrounding the Bureau's beds has been leased from the State by prospective oyster planters at the rate of $1 per acre. The Bureau's work has also shown that seed oysters can be planted in certain parts of the bay where young oysters can not be raised on account of the depredations of the conch, and the indications are that in the course of a few years the heretofore barren bottoms of Barataria Bay alone will support an oyster industry having an annual value several times the entire appropriations for the scientific inquiries of the Bureau. The work has also demonstrated the fitness for oyster culture of thousands of acres of barren bottom in other parts of Louisiana which will eventually be taken up to the great profit of the State. It can further be justly claimed that a large part of the present prosperity of the oyster industry of Louisiana is due to the Bureau's efforts in former years. The present work will be concluded during 1909, and a report will probably be issued before the close of the fiscal year.

Survey of Chesapeake Bay oyster grounds.—The cooperation of the Bureau with the Coast and Geodetic Survey and the Maryland Shell Fish Commission in a survey of the oyster grounds of Chesapeake Bay has been continued. The progress of this work during the year has been satisfactory, and the survey when completed will be of lasting value to the oyster industry, whatever may be the nature of the oyster laws hereafter passed by the State.

Oyster-fattening experiments at Lynnhaven Bay, Virginia.—As stated in the report for last year, these experiments have demonstrated the entire feasibility of fattening oysters by the methods heretofore employed, but the expense attending the work has been too large to make the method commercially successful unless the output of the plant can be materially increased without any considerable increase in the cost of operation. The Bureau believes that this can be done, but the field is an entirely new one, with no even remotely related experience to serve as a guide, and progress is necessarily slow, as each step taken requires practically an entire season for its demonstration. During the fiscal year 1907 the quantity of oysters fattened was slightly more than enough to pay for the increased expense had

the work been carried on as a commercial venture, but during the year 1908 the results were not so encouraging, probably because of a change in the methods employed. The claire was kept closed during the summer in the hope of retaining the oyster food developed during the preceding season, but this change resulted in the production of a large number of diatoms not available to the oysters, while reducing the quantity of those which could be utilized. The result was of value in indicating a procedure which must be avoided in the future.

SPONGE-PLANTING EXPERIMENTS.

The experiments of the Bureau looking to the development of a practical system of sponge culture have reached a stage where the methods can be recommended for commercial purposes, sponges 6 inches and upward in diameter having been produced in four years from cuttings planted by inexpensive means. It is believed that the system can be commercially employed with profit, and it provides an insurance against the obliteration of a valuable industry should the present unnecessarily destructive methods of fishing result in the practical depletion of the natural beds. A report upon this work is in preparation and will be published during the ensuing year. The experiments will be continued with a view to the development of improved methods and the acclimatization of various species in waters to which they are not indigenous.

TERRAPIN-REARING EXPERIMENTS.

The work of devising a practicable method of rearing the diamond-back terrapin has been carried on as usual on the Choptank River, Maryland, but arrangements are being made to transfer the experiments to Beaufort, N. C., where it is thought they can be more economically conducted in connection with the laboratory at that place.

LAKE STUDIES.

In cooperation with the Geological Survey of Wisconsin, the Bureau has been making studies of the biological and physical characteristics of the many lakes of that State. An important feature of this work has been the determination of the gaseous content of the deeper waters, as a result of which it has been learned that there is a deficiency in certain lakes which renders them incapable of supporting fish life in their greater depths. This discovery is important from the standpoint of fish-culture, as it furnishes a hitherto unsuspected reason for the failure of certain plants of lake trout and other species. The investigations will be continued.

At the request of persons living in the vicinity, investigations were made into the causes leading to the extermination of fishes in Devils Lake, North Dakota, and as a result of these the Bureau has been enabled to make practical suggestions for the reintroduction of food species and to point out a source of ample supply. The results of the work are of general utility in connection with the numerous alkaline lakes of the West.

During the summer of 1907 investigations were continued at Sebago Lake, Maine, and in the fall studies were made of the mussel fauna

of Lake Maxinkuckee, Indiana. Investigations were also made at Lake Drummond and in other fresh waters of southern Virginia and North Carolina.

INVESTIGATIONS IN THE PHILIPPINE ISLANDS.

By direction of the President and in pursuance of a plan that has been under consideration for some years, the Bureau has begun a comprehensive survey of the fisheries and aquatic resources of the Philippine Islands. The steamer *Albatross* was detailed for this work, and in October, 1907, left San Francisco with a special staff of assistants under the general direction of the Deputy Commissioner. Manila was reached in November, and from that time until the close of the fiscal year the vessel was engaged in explorations among the islands, and shore parties visited many fishing communities. Large collections of the rich marine fauna of the archipelago have been obtained; much important information has been gathered relative to the methods of fishing and the lines along which improvements may be made; and the investigation gives promise of great benefit to the islands. It is expected that the survey will continue for another year.

MARINE BIOLOGICAL LABORATORIES.

The laboratories of the Bureau at Woods Hole, Mass., and Beaufort, N. C., have been open and occupied as usual during the summer months. The season at Woods Hole was largely given to the collation of results of the biological survey of adjacent waters which has been in progress for the past several years, and it is hoped that the report will be ready for publication during the ensuing year. A large number of investigators from different institutions occupied tables at the laboratory and were engaged in researches, some of which promise valuable economic results. The steamer *Fish Hawk* was as usual detailed to the service of this laboratory. At Beaufort the usual number of investigators were accommodated and conducted studies upon the habits of fishes, experiments in raising sponges from eggs, and in clam and oyster culture. In view of the growing demand for clams and their increasing scarcity on our coasts, the experiments in clam culture are particularly important.

COMMERCIAL FISHERIES.

At the request of the Census Bureau, under direction of which a general canvass of the fisheries is to be made for 1908, most of the usual statistical work of the Bureau of Fisheries was suspended this year, and the division which gives attention to the commercial fisheries devoted the greater part of the time to the collection of data descriptive of apparatus and methods of fishing throughout the country, with a view to the compilation of a complete report upon this subject.

In 1908, as in the two previous years, the Bureau detailed a representative to note the operations of American fishing vessels in Newfoundland waters, and to report as to the observance of the modus vivendi. This detail was made at the request of the Department of State, and extended from September to January.

The Alaska salmon agents were in the field as usual, for the work of inspecting the conditions of the fishery and its dependent industries, and enforcing the laws controlling it. Three instances of violation were found, and the offenders indicted and fined. The season's inquiries covered also the examination of possible hatchery sites with a view to recommendation, and the collection of fishery statistics for the entire region. All of this information has been published in detail in the special report of the Alaska salmon agents issued in May, 1908, which shows a total investment of $9,216,028 and a yield of 178,358,301 pounds, valued at $10,160,183, for the fisheries of Alaska during the calendar year 1907.

The only other statistical inquiries have been by the agents stationed permanently at Boston and Gloucester, the two greatest fishing ports of the country, for which monthly bulletins showing quantity of fish landed by American vessels have been issued as usual. The summary of the receipts of fish at these ports during the calendar year 1907 shows a catch of more than 191,500,000 pounds, valued at over $5,000,000, from grounds off the east coast of the United States, the Canadian provinces, and Newfoundland. The details of these important operations are given in the following table, from which it appears that the receipts at Boston were slightly less and those at Gloucester very much more than in the previous year, while the aggregate value was about $1,000,000 in excess of 1906.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS DURING 1907, BY MONTHS.

Months.	Trips.	Cod.				Cusk.				Haddock.			
		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
		Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
BOSTON.													
January	377	1,816,500	$61,692	....	....	322,000	$5,935	....	....	3,943,200	$113,328	....	....
February	263	1,291,300	50,942	....	....	250,200	5,665	....	....	4,193,200	134,726	....	....
March	422	1,715,500	59,292	....	....	142,100	3,696	....	....	4,705,400	141,787	....	....
April	389	2,049,300	56,378	....	....	145,600	2,917	....	....	4,139,900	85,159	....	....
May	353	2,990,200	69,948	....	....	247,900	4,175	....	....	2,475,500	68,036	....	....
June	253	2,686,500	77,537	....	....	195,000	3,405	....	....	1,842,650	56,994	....	....
July	404	3,636,500	95,695	....	....	107,500	1,723	....	....	1,362,400	32,461	....	....
August	408	3,630,800	90,578	....	....	51,000	960	....	....	3,335,500	71,351	....	....
September	364	3,794,900	101,883	....	....	14,800	279	....	....	3,201,300	80,083	....	....
October	488	2,603,900	97,892	....	....	181,800	3,577	....	....	3,020,600	118,733	....	....
November	302	1,501,550	51,936	....	....	261,600	4,487	....	....	1,895,650	83,931	....	....
December	360	1,558,000	54,063	....	....	404,700	9,004	....	....	1,966,900	77,888	....	....
Total	4,383	29,274,950	867,836	....	....	2,324,200	45,823	....	....	36,082,200	1,064,477	....	....
GLOUCESTER.													
January	89	461,284	11,536	95,671	$4,774	137,338	2,402	230	$6	425,481	8,543	5,487	$97
February	51	189,788	5,368	112,484	5,535	79,018	1,369	400	11	461,031	11,364	2,710	54
March	119	1,471,360	37,109	111,504	5,105	23,561	381	....	....	1,110,844	19,888	....	....
April	195	1,068,411	23,375	445,897	19,244	163,027	2,700	1,390	36	1,426,890	16,524	10,840	218
May	322	1,579,891	33,958	1,004,580	41,030	568,631	9,622	4,812	121	325,385	3,963	74,164	1,482
June	330	2,440,853	48,977	1,529,950	58,013	207,583	3,623	13,333	334	43,819	526	72,443	1,449
July	314	3,942,116	70,062	2,599,947	95,390	823,475	14,852	9,236	225	302,186	3,626	90,467	1,809
August	237	2,388,400	41,476	1,642,800	60,821	1,052,309	18,212	10,650	266	691,627	8,278	63,774	1,277
September	243	2,053,766	48,712	2,682,916	98,168	1,059,749	16,954	8,203	202	434,906	5,218	64,479	1,237
October	343	624,539	12,479	3,037,604	106,715	372,958	6,154	15,923	357	211,891	5,034	53,703	926
November	397	328,325	7,668	1,790,567	67,966	185,677	3,064	5,130	129	150,760	5,379	21,510	353
December	62	128,978	3,599	314,145	12,336	29,095	480	3,050	77	148,083	5,440	3,225	64
Total	2,702	16,677,711	344,319	15,368,065	575,097	4,702,421	79,813	72,357	1,764	5,732,903	93,783	462,802	8,966
Grand total	7,085	45,952,661	1,212,155	15,368,065	575,097	7,026,621	125,636	72,357	1,764	41,815,103	1,158,260	462,802	8,966
Grounds E. of 66° W. long.	535	5,536,428	139,788	10,316,609	374,335	2,423,815	41,022	32,666	780	3,896,752	98,197	201,564	3,849
Grounds W. of 66° W. long.	6,550	40,416,233	1,072,367	5,051,456	200,762	4,602,806	84,614	39,691	984	37,918,351	1,060,063	261,238	5,117
Landed at Boston in 1906	4,505	27,393,650	670,024	....	....	1,326,000	23,943	....	....	47,724,050	990,568	....	....
Landed at Gloucester in 1906	2,401	8,801,966	164,741	18,323,093	633,684	3,774,960	54,727	229,658	4,791	13,471,309	139,530	400,478	6,328

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS DURING 1907, BY MONTHS—Continued.

Months.	Hake.				Pollock.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
BOSTON.												
January	494,000	$11,563			49,900	$1,694			21,900	$2,389		
February	255,100	10,393			28,900	1,090			57,100	5,851		
March	286,100	10,779			18,100	727			26,500	2,597		
April	115,300	3,246			23,700	427			16,200	1,602		
May	496,900	12,198			74,600	1,171			31,270	2,963		
June	772,300	15,581			132,200	2,061			11,000	1,076		
July	234,800	5,999			159,300	2,384			13,120	1,310		
August	531,000	9,003			367.300	4,494			10,150	1,027		
September	677,100	14,197			578,300	8,886			12,290	1,039		
October	2,754,200	40,202			1,223,100	18,896			5,900	639		
November	2,354,100	31,743			1,094,900	11,659			5,100	694		
December	992,500	28,908			493,800	13,799			5,100	1,065		
Total	9,963,400	193,812			4,244,100	67,288			215,630	22,252		
GLOUCESTER.												
January	12,200	193			14,373	170	3,225	$57	135,010	13,172		
February	5,135	134			5,758	65	6,700	128	369,712	30,616		
March	20,460	314			1,658	32	1,426	30	204,130	19,427		
April	24,000	264	8,516	$172	411,562	4,237	4,610	92	461,030	36,498	3,297	$203
May	155,031	2,103	5,340	104	2,299,937	24,617	51,412	1,028	209,621	14,337		
June	1,159,610	16,235	26,955	540	3,095,092	29,559	305,736	5,826	487,928	35,734	8,259	496
July	2,009,322	26,391	24,801	497	256,747	1,920	84,491	1,516	288,780	20,551	17,534	1,051
August	1,804,378	23,456	50,194	1,004	177,509	1,358	68,287	1,195	318,703	20,394	16,440	986
September	2,084,359	24,472	12,093	223	499,420	4,240	114,312	1,868	317,986	25,481	512,894	41,947
October	1,559,984	17,179	69,816	1,047	3,164,772	26,971	67,597	1,014	108,707	11,880	340,912	28,261
November	717,461	7,892	13,057	196	6,212,967	47,534	47,945	656	97,945	10,730	4,050	284
December	64,975	1,129	3,170	47	43,904	825	20,210	300	78,310	9,066	510	36
Total	9,616,915	119,762	213,942	3,830	16,183,699	141,528	775,951	13,710	3,077,862	247,886	903,896	73,264
Grand total	19,580,315	313,574	213,942	3,830	20,427,799	208,816	775,951	13,710	3,293,492	270,138	903,896	73,264
Grounds E. of 66° W. long	5,611,717	72,852	189,692	3,351	140.196	1,429	376,991	6,651	2,673,455	215,565	903,896	73,264
Grounds W. of 66° W. long	13,968,598	240,722	24,250	479	20,287,603	207,387	398,960	7,059	620,037	54,573		
Landed at Boston in 1906	7,629,800	152,232			2,310,600	45,776			572,250	41,922		
Landed at Gloucester in 1906	5,397,264	62,661	260,275	3,379	6,211,899	55,205	987,763	14,192	3,446,315	229,249	635,881	45,141

Months.	Mackerel.				Other fish.[a]				Total.				Grand total.	
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.			
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
BOSTON.														
January									6,647,500	$196,601			6,647,500	$196,601
February									6,075,800	208,667			6,075,800	208,667
March									6,893,700	218,878			6,893,700	218,878
April									6,490,000	149,729			6,490,000	149,729
May									6,316,370	158,491			6,316,370	158,491
June	323,500	$19,542	93,000	$5,415	126,050	$10,020			6,089,200	186,216	93,000	$5,415	6,182,200	191,631
July	2,226,001	117,987	197,600	13,027	988,500	69,312			8,728,121	326,871	197,600	13,027	8,925,721	339,898
August	903,325	68,860	68,400	5,495	765,400	60,027			9,594,475	306,300	68,400	5,495	9,662,875	311,795
September	87,500	13,082	35,000	3,350	183,350	22,614			8,549,540	242,063	35,000	3,350	8,584,540	245,413
October	2,330	610			6,900	484			9,798,730	281,033			9,798,730	281,033
November									7,112,900	184,450			7,112,900	184,450
December									5,421,000	184,727			5,421,000	184,727
Total	3,542,656	220,081	394,000	27,287	2,070,200	162,457			87,717,336	2,644,026	394,000	27,287	88,111,336	2,671,313
GLOUCESTER.														
January					4,036,250	105,343	6,674,700	$124,695	5,221,936	141,359	6,779,313	129,629	12,001,249	270,988
February									1,110,442	48,916	122,294	5,728	1,232,736	54,644
March									2,832,013	77,151	112,930	5,135	2,944,943	82,286
April									3,554,920	83,598	474,550	19,965	4,029,470	103,563
May	17,910	1,024	6,260	373	187,500	6,000	176,700	3,488	5,343,906	95,624	1,323,268	47,626	6,667,174	143,250
June	160,200	7,358	772,800	42,504					7,595,085	142,012	2,729,476	109,162	10,324,561	251,174
July	217,260	8,794	2,633,600	167,164	2,108,900	7,769			9,948,786	153,965	5,460,076	267,652	15,408,862	421,617
August	113,580	6,435	1,808,200	158,477					6,546,506	119,609	3,660,345	224,026	10,206,851	343,635
September	34,200	3,035	549,000	52,684	32,740	446	15,000	325	6,517,126	128,558	3,958,897	196,654	10,476,023	325,212
October	720	84	36,800	5,099	114,660	1,405	548,600	10,004	6,158,231	81,186	4,170,955	153,423	10,329,186	234,609
November	4,500	500	185,200	18,470	600,000	9,600	2,377,000	42,441	8,297,635	92,367	4,444,459	130,495	12,742,094	222,862
December					437,500	13,750	5,822,112	90,801	930,845	34,289	6,166,422	103,661	7,097,267	137,950
Total	548,370	27,230	5,991,860	444,771	7,517,550	144,313	15,614,112	271,754	64,057,431	1,198,634	39,402,985	1,393,156	103,460,416	2,591,790
Grand total	4,091,026	247,311	6,385,860	472,058	9,587,750	306,770	15,614,112	271,754	151,774,767	3,842,660	39,796,985	1,420,443	191,571,752	5,263,103
Grounds E. of 66° W. long.	429,600	25,120	2,339,600	138,612	5,261,650	134,753	14,528,512	254,247	25,973,613	728,726	28,889,530	855,089	54,863,143	1,583,815
Grounds W. of 66° W. long.	3,661,426	222,191	4,046,260	333,446	4,326,100	172,017	1,085,600	17,507	125,801,154	3,113,934	10,907,455	565,354	136,708,609	3,679,288
Landed at Boston in 1906	1,301,850	94,459	83,200	9,659	1,351,970	88,741			89,610,170	2,107,665	83,200	9,659	89,693,370	2,117,324
Landed at Gloucester in 1906	437,890	22,144	2,016,400	162,311	5,365,721	159,700	10,946,968	197,255	46,907,324	887,957	33,800,516	1,067,081	80,707,840	1,955,038

[a] Includes herring from Newfoundland, 5,261,250 pounds frozen, $134,693, and 14,528,512 pounds salted, $254,247.

As bearing on the international question of the dependence of American fishermen upon the grounds lying off Newfoundland and the British maritime provinces, the following table is of unusual interest. About three-fourths of the total catch is shown to have been taken from grounds off the United States coast.

QUANTITY AND VALUE OF FISH LANDED BY AMERICAN FISHING VESSELS AT BOSTON AND GLOUCESTER, MASS., IN 1907 FROM GROUNDS OFF THE COASTS OF THE UNITED STATES AND OF NEWFOUNDLAND AND OTHER BRITISH PROVINCES.

Species.	United States.		Newfoundland.		Other British provinces.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Cod:								
Fresh	40,286,458	$1,069,627	83,230	$1,860	5,582,973	$140,668	45,952,661	$1,212,155
Salted	5,043,471	200,384	2,251,080	81,890	8,073,514	292,823	15,368,065	575,097
Cusk:								
Fresh	4,141,011	76,779	450	7	2,885,160	48,850	7,026,621	125,636
Salted	39,691	984	1,385	35	31,281	745	72,357	1,764
Haddock:								
Fresh	37,884,451	1,059,621			3,930,652	98,639	41,815,103	1,158,260
Salted	260,483	5,102	29,605	571	172,714	3,293	462,802	8,966
Hake:								
Fresh	13,596,923	236,383	12,830	193	5,970,562	76,998	19,580,315	313,574
Salted	23,850	471	21,989	413	168,103	2,946	213,942	3,830
Pollock:								
Fresh	20,279,083	207,304	18,465	129	130,251	1,383	20,427,799	208,816
Salted	398,960	7,059	7,389	122	369,602	6,529	775,951	13,710
Halibut:								
Fresh	599,491	52,712	1,205,198	92,483	1,488,803	124,943	3,293,492	270,138
Salted			879,072	71,676	24,824	1,588	903,896	73,264
Mackerel:								
Fresh	3,661,426	222,191			429,600	25,120	4,091,026	247,311
Salted	4,046,260	333,446			2,339,600	138,612	6,385,860	472,058
Herring:								
Fresh	140,400	1,763	5,261,250	134,693			5,401,650	136,456
Salted	1,085,600	17,507	14,528,512	254,247			15,614,112	271,754
Swordfish, fresh	2,043,550	161,897			400	60	2,043,950	161,957
Other fish, fresh	2,142,150	8,357					2,142,150	8,357
Total	135,673,258	3,661,587	24,300,455	638,319	31,598,039	963,197	191,571,752	5,263,103

ADMINISTRATION.

NEW STATIONS AND IMPROVEMENTS.

Numerous bills for the establishment of fish-cultural stations were introduced in Congress at its last session and referred to the Department for recommendation, and owing to the growing need for additional hatcheries it was possible to make a favorable report in nearly every case. Only a single hatchery bill became a law, however, and this provided for a station for mussel culture in the Mississippi Valley.

The new salmon hatchery on Afognak Island, Alaska, has been nearly completed and will be ready for operation the present season. The hatchery building, similar in construction and capacity to the Yes Lake hatchery, is commodious and convenient, and the station is provided with comfortable quarters for the employees.

In addition to the usual necessary repairs, there have been extensive improvements at some of the stations during the year, consisting variously of buildings or ponds to increase the hatchery capacity, the purchase of additional land, the alteration of water supply, and different kinds of construction work. An addition to the Boothbay, Me., hatchery that will greatly promote the efficiency of the lobster

work is a large pound or inclosure in which brood lobsters to the number of many thousands may be retained pending the taking of the eggs.

LIBRARY AND PUBLICATIONS.

The library of the Bureau, which is strictly technical, has been increased during the past year by 174 bound volumes and 158 unbound books and separates, these being purchases and donations some of which were assigned to the branch libraries at the biological laboratories and fish-cultural stations. A revision of the catalogue is in progress, and the usefulness of the library has been increased also by the provision of a reference index and a system of interloaning with other technical libraries.

The Bureau published 16 pamphlet documents in 1908, these papers dealing respectively with various subjects in the different fields of work and being in some cases exhaustive in scope and treatment. Four extracts from the revised edition of the Manual of Fish Culture, published in 1900, were reprinted.

In accordance with the plan adopted several years ago, the Bureau's publications are now supplied to the public only in pamphlet form, this being deemed a more economical and satisfactory method than the former issue consisting chiefly of volumes. All publications are furnished free upon request, addresses on a regular mailing list being supplied promptly as the documents are received from the printer. In addition requests from all sources are complied with daily as received, 21,561 pamphlets being thus distributed in 1908. The total distribution of publications for this year was 32,904, including besides the above the documents supplied to the regular mailing list and a number of back volumes of the Report and Bulletin as formerly issued.

SALARIES AND EXPENSES.

A recent decision of the Treasury relative to subsistence for certain employees of the Bureau has produced a condition for which it becomes necessary to ask Congress to provide a remedy. Baker Lake, Washington, and Yes Bay and Afognak, Alaska, at which places the Bureau operates fish-cultural stations, are in the wilderness, long distances from any source of supply, with no opportunity for men to board, and it is impossible for employees to obtain provisions except as provided by the Government. Baker Lake, Washington, is 17 miles from a railroad, and all provisions must be transported over a rough mountain trail by means of pack ponies, winter supplies being purchased in bulk and brought in before the trail is blockaded by snow. Yes Bay, Alaska, is about 40 miles from the nearest base of supply, with only an irregular communication by water, which in winter sometimes ceases entirely. The conditions at Afognak, Alaska, are even worse, and when that station is fully completed similar arrangements for subsistence will be necessary. The employees of these stations accepted their places with the understanding that subsistence would be furnished, as is customary in hiring men for lumbering operations and other work at a distance from settlements, and it is doubted whether it would be possible without such an arrangement to maintain an efficient personnel at these remote localities.

In view of these conditions, it has been customary and has seemed advisable to allow subsistence to employees at the stations in question. Recently, however, it has been decided by the Treasury Department that under the law subsistence can not be furnished to statutory employees even under these unusual circumstances. It is accordingly recommended that Congress be asked either specifically to authorize the subsistence or else to increase the wages of such employees commensurably.

In submitting estimates for the conduct of the work for the fiscal year 1908 the Bureau asked that the salaries of all skilled laborers, laborers, seamen, firemen, messengers, and cooks receiving less than $720 per annum be increased to that amount. Owing to the increased cost of living in all parts of the country and the demands of commercial business, it is no longer possible to secure competent services for less than the above salary, and the duties required of the employees indicated are worth more than this compensation. Skilled laborers and laborers are expected to and do perform the same work as fish-culturists and are appointed from the civil-service fish-cultural lists. Attention has before been called to the inadequate pay of the firemen and messengers in this Bureau as compared with that of similar positions in other branches of the Government service. Seamen and cooks are obliged to pay mess bills out of their salaries, thus leaving such small balances under the present rates that good and reliable men are not attracted to the service. The recommended increases aggregated $15,360. This recommendation was only partially complied with, salaries less than $600 being raised to the latter amount. The matter is still regarded as of the greatest importance, and it is earnestly hoped that favorable action will be taken by Congress the coming year.

APPROPRIATIONS.

The appropriations for the Bureau for the fiscal year 1908 were as follows:

Salaries	$288,660
Agents at Alaska Salmon Fisheries	4,500
Miscellaneous expenses:	
Administration	8,000
Propagation of food fishes	275,000
Inquiry respecting food fishes	25,000
Statistical inquiry	7,500
Maintenance of vessels	55,000
For construction of buildings and wharves and purchase of lobster pound, Boothbay Harbor, Maine	15,000
For construction and repairs of buildings, ponds, and reservoir at Spearfish, S. Dak	5,000
For completion of fish hatcheries in Alaska	20,000

In accordance with law the expenditures under these several appropriations will be the subject of a special report.

CONSERVATION OF FISHERY RESOURCES.

The year has been marked by unusual interest in the protection of the inhabitants of our interior and coastwise waters and by noteworthy movements for the maintenance of fishery resources. Foremost among the measures of this kind is the formation of the National Conservation Commission, whose plans and purposes are of far-reaching importance to the fisheries. It is hoped that, in addition to its other functions, this commission will definitely ascertain and recommend the relations that the fisheries should bear to agriculture, forestry, navigation, mining, and other industries, and will also take steps for cooperation between fishing and irrigation in all public and interstate waters.

Another very important matter affecting the fisheries is the convention concluded between the United States and Great Britain under date of April 11, 1908, by which international regulations for the protection and preservation of the food fishes of the Great Lakes and other waters contiguous to the United States and Canada will be formulated and enforced by an international commission appointed by the two Governments. The necessity for such an international agreement has long been appreciated; and the practical unanimity with which the States have been willing to relinquish jurisdiction heretofore exercised is a most encouraging evidence of regard for the welfare of the fisheries.

The most serious condition now confronting the American fishing industry is the failure of the States to afford adequate protection to migratory fishes in state and interstate waters. With the history of the New England salmon fishery as a warning, some of the States seem yet absolutely indifferent to the crying needs of fisheries for species of similar habits, whose obliteration is as certain as that of the salmon in the Kennebec and the sturgeon in the Potomac, unless radical corrective measures are taken. The fishes most in need of consideration are the shad, the striped bass, and the sturgeon on the Atlantic coast and the salmons in the Pacific States.

The striped bass has been referred to elsewhere. The disappearance of the sturgeon from nearly every east-coast river shows how greed and indifference may in a single generation destroy a valuable fishery. The case of the shad has frequently been pointed out in the reports of the Bureau; the general decline of this fishery, and consequently in the hatchery work, for which eggs are obtained from fish caught for market, has been arrested only in North Carolina among all the States in which the Bureau engages in shad cultivation. The immediate effect of sensible protective measures in this State shows the results that may be expected from similar legislation for the various important streams, like the Potomac, the Susquehanna, and the Delaware, in which the shad has been persistently destroyed year after year without any regard for the future.

The condition and trend of the salmon fishery of the Columbia River is cause for serious concern. The situation has demanded prompt and judicious action if this fishery is to be preserved, yet factional and personal considerations have been allowed to interfere with the passage of the needed laws, and the condition remains unrelieved. The Bureau's efforts in artificial propagation are nega-

tived by the States' indifference, and the necessity for Federal control of interstate waters in the interest of the fisheries is thus again forcefully illustrated.

RECOMMENDATIONS.

NEW FISH-CULTURAL STATIONS.

The growth of the fish-cultural branch of the Federal fishery service and the increasing demands for food and game fishes necessitate the establishment of additional hatcheries from time to time. At present the greatest need exists in the Mississippi Valley and Southern States, for the cultivation of commercial fishes adapted for culture in ponds and small water courses, and it is strongly urged that early provision be made for a limited number of hatcheries in those regions.

INCREASED FACILITIES FOR RESCUING FISH FROM OVERFLOWED LANDS.

This important work, which in some respects is more beneficial than artificial propagation, is susceptible of great expansion and may be made the means of saving millions of most desirable food fishes that are now lost each year. To this end there should be established in convenient parts of the Mississippi Valley several stations with large pond capacity for the retention of rescued fishes pending their distribution to suitable waters.

NEW FISH-CULTURAL EXPERIMENT STATION.

It is urgently recommended that there be established within convenient distance from Washington a composite station for pond and river fishes, which shall be operated chiefly for the purpose of developing and improving methods and for the solution of the numerous problems that are continually arising in the course of the Bureau's work. Such a station as is desired was in a measure afforded by the Fish Lakes in Washington; but since their abandonment the Bureau has had no adequate facilities for experimental work under executive supervision, and the settlement of various important questions has had to be deferred, for it is not possible to carry on the necessary investigations at the established hatcheries because, in addition to adverse conditions for the experiments, the regular and required hatchery work would be interfered with and the output of fish curtailed. The expense of such a station, with the additional expert services the work requires, would be more than repaid by the increased efficiency of the fish-cultural work and the greater economy of administration.

FEDERAL CONTROL OF INTERSTATE FISHERIES AND FISH TRADE.

In the present far-reaching movement for conservation of natural resources, the necessity for uniform and adequate fishery protective laws covering interstate waters has been emphasized anew. It is accordingly believed that in view of the lack of concerted action on

the part of the States the migratory fishes, at least, in such waters should be made the subject of Federal legislation. Such legislation should furthermore be reenforced by extension of the provisions of the Lacey Act to interstate traffic in fish and fishery products.

NEW BUILDING AND AQUARIUM.

Again is urged the necessity for providing the Bureau with adequate office, laboratory, and aquarium facilities, a recommendation that has been approved by the present Secretary and his two predecessors. The present cramped and obsolete quarters, lacking in laboratory and storage facilities, greatly retard the operations of the Bureau and diminish its efficiency in various essential lines of work. A new building on the present or an adjoining site is an absolute essential for enabling the Bureau to meet the increasing exactions of modern fishery work and to live up to its well-earned reputation at home and abroad. In conjunction with this building there should be maintained a suitable public aquarium, which would be one of the chief attractions and educational institutions of the capital city.

INCREASE OF SALARIES.

In the estimates submitted to the Department for the appropriations required for the Bureau for the fiscal year 1910 request has been made for small increases in the salaries of executive, technical, and clerical employees. These additions are demanded in the interests of increased efficiency and as a matter of simple justice to deserving employees. The recommended additions to salaries, including several new positions, aggregate $15,300, which sum is offset by a reduction of $51,000 in other items, so that the amount estimated for the maintenance of the Bureau for 1910 is $35,700 less than was appropriated for 1909.

Respectfully,

Geo. M. Bowers,
Commissioner.

To Hon. Oscar S. Straus,
Secretary of Commerce and Labor.

THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1908

Bureau of Fisheries Document No. 644

CONTENTS.

THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1908.

CHARACTER OF THE WORK.

More than 95 per cent of the output of the fish-cultural stations consists of important commercial species, notably the salmons, shad, whitefish, pike perch, yellow perch, white perch, lake trout, cod, pollock, flatfish, and lobsters. These are hatched in lots of many millions annually and planted by the Bureau, the fresh-water species principally in the large coastal streams and in the Great Lakes, the marine species upon the inshore fishing grounds of the Atlantic.

The cultivation of the fishes of the interior waters generally classed as game fishes, although a comparatively small factor in the total output, is a very important feature of the Bureau's work, supplying as it does various kinds of young fish for public streams, lakes and ponds, fishing preserves, private ponds, streams, etc., in all parts of the United States. Among the fishes most extensively cultivated for these purposes are the landlocked salmon, several species of trout, the grayling, the basses, crappie, bream, and catfish; but various others also are handled. The trouts are artificially hatched from eggs taken from both wild and domesticated stock; the basses, catfishes, and others are derived from mature fish held in ponds for breeding purposes, or (except the small-mouth black bass) they are rescued from the overflows of the Mississippi and Illinois rivers. Collections from the latter sources include also pike, buffalo fish, and several others, which are not distributed to applicants but are returned immediately to the main streams.

METHOD OF DISTRIBUTION.

The first consideration in the Bureau's distribution of fishes is to make ample return to the waters from which eggs or fish have been collected. The remainder of the product is consigned to suitable public or private waters on application which is endorsed by a United States Senator or Representative. The fish are carried to their destination in railroad cars equipped for the purpose, or by messengers who accompany the shipments in baggage cars, and are delivered to the applicant free of charge, at the railroad station nearest the point of deposit. During the past fiscal year (July 1, 1907, to June 30, 1908), the Bureau received 8,284 applications for fish, nearly all for the game species. The demand, especially for the basses, crappie, and the catfishes, has for some time been greater

than could be met with available resources, and the number of applications this year was 1,938 more than in 1907.

ALLOTMENTS.

The supply of particular fishes available for distribution, and consequently of the number allotted to individual applicants, is largely determined by the difference in methods of hatching the different species and the present facilities therefor. The area and character of the water to be stocked, however, must likewise be considered; the water area that would receive a million pike perch fry would perhaps be assigned no more than 200 or 300 black bass 3 or 4 inches long, or four to eight times that many if the bass were planted as fry. The explanation is in the fact that pike perch can be propagated by the hundred million, while black bass, hatched by other methods or collected from overflowed lands, can be produced only in comparatively small numbers. The Bureau does not attempt to allot to any applicant more than a liberal brood stock of the basses or sunfishes. With brook trout, which are distributed both as fry and fingerlings, allotments of fry are many times larger than allotments of fingerlings 3 to 4 inches long.

SIZE OF FISH WHEN DISTRIBUTED.

Fishes are distributed at various stages of development, according to the species, the numbers in the hatcheries, and the facilities for rearing. The commercial fishes—such as the shad, whitefish, lake trout, pike, perch, cod, etc., hatched in lots of many millions—are necessarily planted as fry. It is customary to distribute them just before the umbilical sac is completely absorbed. Atlantic salmon, landlocked salmon, and various species of trout, in such numbers as the hatchery facilities permit, are reared to fingerlings from 1 to 6 6 inches in length; the remainder are distributed as fry.

The basses, bream, and other sunfishes are distributed from the fish-cultural stations and ponds from some three weeks after they are hatched until they are several months of age. When the last lots are shipped the basses usually range from 4 to 6 inches and the sunfishes from 2 to 4 inches in length. The numerous fishes collected in overflowed lands—basses, crappie, sunfishes, catfishes, yellow perch, and others—are 2 to 6 inches in length when taken and distributed.

Eggs are distributed only to state hatcheries or to applicants who have hatchery facilities.

The varying usage in the classification of young fish as to size has caused such confusion and difficulty that the Bureau has adopted uniform definitions, as follows:

Fry=fish up to the time the yolk sac is absorbed and feeding begins.

Advanced fry=fish from the end of the fry period until they have reached a length of 1 inch.

Fingerlings=fish between the length of 1 inch and the yearling stage, the various sizes to be designated as follows: No. 1, a fish 1 inch in length and up to 2 inches; No. 2, a fish 2 inches in length and up to 3 inches; No. 3, a fish 3 inches in length and up to 4 inches, etc.

Yearlings=fish that are 1 year old, but less than 2 years old from the date of hatching; these may be designated No. 1, No. 2, No. 3, etc., after the plan prescribed for fingerlings.

SPECIES CULTIVATED IN 1908.

The following full list of species that the Bureau was concerned with in 1908 includes some 50 fishes and the lobster. Except as otherwise indicated all of these were artificially propagated.

THE CATFISHES (SILURIDÆ):

- Spotted cat, blue cat, channel cat (*Ictalurus punctatus*). Collected from overflows, in addition to being artificially propagated.
- Horned pout, bullhead, yellow cat (*Ameiurus nebulosus*). Collected from overflows, in addition to being artificially propagated.
- Marbled cat (*Ameiurus nebulosus marmoratus*).

THE SUCKERS AND BUFFALOFISHES (CATOSTOMIDÆ):

- Small-mouth buffalofish (*Ictiobus bubalus*). Collected from overflows.

THE MINNOWS AND CARPS (CYPRINIDÆ):

- Carp (*Cyprinus carpio*). Propagated principally as food for other fishes, but also distributed.
- Goldfish (*Carassius auratus*). Introduced species, propagated for ornamental purposes; not distributed.
- Tench (*Tinca tinca*). Cultivated varieties, green tench and golden tench. Introduced species, propagated for ornamental purposes; not distributed.
- Ide (*Leuciscus idus*). Cultivated variety, golden ide. Introduced species, propagated for ornamental purposes; not distributed.

THE SHADS AND HERRINGS (CLUPEIDÆ):

- Shad (*Alosa sapidissima*).

THE SALMONS, TROUTS, WHITEFISHES, ETC. (SALMONIDÆ):

- Common whitefish (*Coregonus clupeiformis*).
- Lake herring, cisco (*Argyrosomus artedi*).
- Chinook salmon, king salmon, quinnat salmon (*Oncorhynchus tschawytscha*).
- Silver salmon, coho (*Oncorhynchus kisutch*).
- Blueback salmon, redfish, sockeye (*Oncorhynchus nerka*).
- Humpback salmon (*Oncorhynchus gorbuscha*).
- Steelhead, hardhead (*Salmo gairdneri*).
- Rainbow trout (*Salmo irideus*).
- Atlantic salmon (*Salmo salar*).
- Landlocked salmon (*Salmo sebago*).
- Yellowstone Lake trout, cutthroat trout, blackspotted trout (*Salmo lewisi*).
- Colorado River trout, blackspotted trout (*Salmo pleuriticus*).
- Golden trout (*Salmo roosvelti*).
- Sea trout (*Salmo trutta*). Introduced species.
- Loch Leven trout (*Salmo trutta levenensis*). Introduced species, propagated in limited numbers for observation under natural conditions.
- Lake trout, Mackinaw trout, longe, togue (*Cristovomer namaycush*).
- Brook trout, speckled trout (*Salvelinus fontinalis*).
- Sunapee trout (*Salvelinus aureolus*).
- Canadian red trout (*Salvelinus marstoni*).
- Hybrid trout (*Salvelinus aureolus*).

THE GRAYLINGS (THYMALLIDÆ):

Montana grayling (*Thymallus montanus*).

THE PIKES AND PICKERELS (ESOCIDÆ):

Pike (*Esox lucius*). Collected from overflows.
Pickerel (*Esox reticulatus*). Collected from overflows.

THE BASSES, SUNFISHES, AND CRAPPIES (CENTRARCHIDÆ):

Crappie (*Pomoxis annularis*). Propagated and collected.
Strawberry bass, calico bass (*Pomoxis sparoides*).
Rock bass, red-eye, goggle-eye (*Ambloplites rupestris*). Propagated and collected.
Warmouth, goggle-eye (*Chænobryttus gulosus*). Propagated and collected.
Small-mouth black bass (*Micropterus dolomieu*).
Large-mouth black bass (*Micropterus salmoides*). Propagated and collected.
Bluegill sunfish (*Lepomis pallidus*). Propagated and collected.
Other sunfishes, chiefly *Eupomotis gibbosus*. Collected.

THE PERCHES (PERCIDÆ):

Pike perch, wall-eyed pike, yellow pike, blue pike (*Stizostedion vitreum*). Collected.
Yellow perch (*Perca flavescens*). Collected.
White bass (*Roccus chrysops*).

THE SEA BASSES (SERRANIDÆ):

Striped bass, rockfish (*Roccus lineatus*).
White perch (*Morone americana*).

THE CODS (GADIDÆ):

Cod (*Gadus callarias*).
Pollock (*Pollachius virens*).
Haddock (*Melanogrammus æglefinus*).

THE LABRIDS (LABRIDÆ):

Tautog, blackfish (*Tautoga onitis*).

THE FLOUNDERS (PLEURONECTIDÆ):

Winter flounder, American flatfish (*Pseudopleuronectes americanus*).

THE CROAKERS (SCIÆNIDÆ):

Freshwater drum (*Aplodinotus gruinniens*).

CRUSTACEANS:

American lobster (*Homarus americanus*).

OUTPUT.

SUMMARIZED STATEMENT.

As the result of special efforts in the hatchery work this year, the output of fish and eggs in 1908 was greater than ever before in the history of the Bureau, reaching a total of 2,871,456,280. Of this number 2,413,809,225 were young fish distributed for the stocking and restocking of public and private waters, and the remaining 457,647,055 were eggs delivered to state and foreign hatcheries. The output of young fish exceeds the greatest previous record for any one year by 376,000,000.

Whitefish, silver, blueback and humpback salmons, rainbow and brook trouts, large-mouth and small-mouth black basses, yellow perch and white perch, cod, flatfish, and lobsters show the largest

increases over last year. The shad collections, while not conspicuous numerically, were notably greater than in 1907, owing to the effect of restrictive fishing laws in North Carolina, where the Bureau has a hatching station. The number of lake trout, pike perch, and chinook and Atlantic salmons was smaller than in the preceding year, but the decrease was a normal one.

SUMMARY OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1908.

Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Catfish			277,601	277,601
Carp			350	350
Buffalofish			40,500	40,500
Shad	760,000	79,316,600		80,076,600
Whitefish	139,266,000	384,480,000		523,746,000
Lake cisco	12,790,000	3,200,000		15,990,000
Chinook salmon	68,385,550	24,998,185	2,231,797	95,615,532
Silver salmon	296,000	13,420,714	57,932	13,774,646
Blueback salmon	75,000	69,883,305		69,958,305
Humpback salmon		7,185,748		7,185,748
Steelhead trout	333,725	1,123,146	59,000	1,515,871
Rainbow trout	830,000	253,650	2,713,700	3,797,250
Atlantic salmon		2,079,514	30,003	2,109,517
Landlocked salmon	190,000	441,281	151,526	782,807
Blackspotted trout	768,380	4,230,540	1,442,376	6,441,296
Loch Leven trout			55,012	55,012
Lake trout	2,734,000	25,267,078	3,182,080	31,183,158
Brook trout	1,473,400	6,307,048	3,471,292	11,251,740
Sunapee trout		191,736		191,736
Grayling	200,000	1,047,000		1,247,000
Pike			17,550	17,550
Crappie and strawberry bass			200,268	200,268
Rock bass			25,090	25,090
Warmouth bass			1,638	1,638
Small-mouth black bass		232,312	78,940	311,252
Large-mouth black bass		23,900	588,047	611,947
Bream or sunfish			202,810	202,810
Pike perch	218,725,000	193,438,000		412,163,000
Yellow perch	2,080,000	382,576,000	68,045	384,724,045
Striped bass		4,333,500		4,333,500
White perch	5,740,000	321,670,000		327,410,000
White bass			500	500
Freshwater drum			26,000	26,000
Cod	3,000,000	235,365,000		238,365,000
Flatfish		389,642,000		389,642,000
Pollock		66,454,000		66,454,000
Tautog		794,000		794,000
Lobster		180,932,000	1,011	180,933,011
Total	457,647,055	2,398,886,257	14,922,968	2,871,456,280

WORK AND OUTPUT OF THE STATIONS.

The following tabulation lists all of the stations operated by the Bureau in 1908, and shows for each the period of operation, the kinds of fishes handled, and the number of fish and eggs produced. It shows also the character of the work in each locality and in some degree the relative importance of the stations. The last statement should be qualified, however, for particular instances. Some substations are more important in the actual fish-cultural work than are the stations to which they are, for purposes of administration, subordinate; but the output of these important substations is not always shown separate from that of the main hatchery. Distinctions are indicated to some extent in the table by means of a scheme of type. All of the stations and all of the substations where eggs were hatched

are printed in ordinary roman type, with marginal indentions to show their relative administrative status. Substations which were merely collecting points, perhaps shifting in location from year to year, are printed in italics, and their output is ordinarily included with the output of that species credited to the main station. The transfers of eggs and fish from station to station are recorded in footnotes under the station from which taken, and the yield is credited to the receiving station. Transfers of eggs are frequent, serving convenience and economy in transportation to stations which are to be distributing centers for the respective species, for the shipment of eggs is easier and cheaper than the shipment of young fish.

STATIONS OPERATED AND THE OUTPUT OF EACH.

Station.	Period of operation.	Species handled.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Baird, Cal.[a]	Entire year	Chinook salmon	10,442,950	4,780,855	
Battle Creek, Cal	Oct. 1-Jan. 21	do	36,379,700		
Bouldin Island, Cal	Apr. 17-June 17	Striped bass		1,272,500	
Mill Creek, Cal.[a]	Oct. 1-Feb. 2	Chinook salmon	18,132,900		
Yreka, Cal.[a]	Dec. 18-Apr. 1	Rainbow trout	200,000		
Baker Lake, Wash	Entire year	Blueback salmon		8,456,145	
		Chinook salmon		430,245	
		Humpback salmon		76,165	
		Silver salmon		10,481,000	
Birdsview, Wash.[a]	do	Blueback salmon	75,000	58,160	
		Chinook salmon		68,064	
		Humpback salmon		6,688,597	
		Silver salmon	296,000	2,781,714	
		Steelhead trout	120,000	136,916	
Battery, Havre de Grace, Md.[a]	Mar. 4-May 23	Shad		10,264,600	
		Yellow perch	2,080,000	239,491,000	
		White perch	5,740,000	317,820,000	
Boothbay Harbor, Me	Entire year	Cod		42,252,000	
		Lobster		134,506,000	1,526
Pemaquid, Me	do	do			
Portland, Me	May-October	do			
Kittery Point	July 1-Sept. 30	do			
Bozeman, Mont.[a]	Entire year	Brook trout			188,700
		Rainbow trout			58,700
		Steelhead trout			10,000
		Blackspotted trout			602,000
		Golden trout			
		Landlocked salmon			6,000
Redrock, Mont	Apr. 1-June 25	Grayling	200,000	997,000	
Bryans Point, Md.[a]	Mar. 2-May 27	Shad		26,539,000	
		Yellow perch		129,241,000	
Cape Vincent, N. Y	Entire year	Whitefish		44,200,000	
		Pike perch		9,900,000	
		Yellow perch		600,000	
		Lake trout		4,352,120	
		Brook trout		766,000	141,000
		Steelhead trout		19,550	
		Landlocked salmon		28,500	
Central Station and aquaria, Washington, D. C.	do	Shad		600,000	
		Whitefish		480,000	
		Lake trout		9,475	

[a] For convenience in handling, transfers were made as follows:
Baird to Central Station, 35,000 chinook salmon eggs.
Mill Creek to Baird, 1,285,000 chinook salmon eggs.
Yreka to Clackamas, 100,000 rainbow trout eggs.
Birdsview to Craig Brook, 502,000 humpback salmon eggs, and to other stations, 104,000 steelhead-trout eggs.
Battery to Central Station, 6,048,000 white-perch eggs.
Bozeman to Leadville, 50,000 grayling eggs.
Bryans Point to Central Station, 639,000 shad eggs and 3,120,000 yellow perch eggs.

STATIONS OPERATED AND THE OUTPUT OF EACH—Continued.

Station.	Period of operation.	Species handled.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Central Station and aquaria, Washington, D. C.[a]—Continued.	Entire year	Brook trout		20,300	
		Pike perch		1,650,000	
		Yellow perch		3,000,000	
		White perch		3,850,000	
Clackamas, Oregon City, Oreg.[a]	do	Chinook salmon	115,000	2,894,800	457,805
		Silver salmon			57,932
		Landlocked salmon		7,710	
		Steelhead trout		15,000	
		Blackspotted trout		77,000	
		Rainbow trout		160,600	
		Brook trout		375,250	5,430
		Lake trout			24,110
Big White Salmon, Wash.	Aug. 1–May 1	Chinook salmon		4,304,194	958,141
Eagle and Tanner creeks, Columbia River, Oreg.[a]	Aug. 1–Nov. 14	do			
Eagle Creek, Clackamas River, Oreg.	Mar. 15–June 1	Steelhead trout			
Findley Eddy, Rogue River, Oreg.	Aug. 1–May 1	Chinook salmon	1,500,000	845,000	170,051
		Silver salmon		85,000	
Illinois River, Rogue River, Oreg.	Aug. 1–Apr. 30	Chinook salmon	300,000	4,064,025	
		Steelhead trout	20,000	19,700	
Little White Salmon, Wash.	Entire year	Chinook salmon	1,485,000	7,570,000	579,800
Rogue River (Elk Creek), Oreg.	do	do	30,000	41,002	
		Steelhead trout	193,725	917,980	
		Blackspotted trout		34,670	
		Silver salmon		73,000	
Applegate Creek, Rogue River, Oreg.	Feb. 1–Apr. 30	Steelhead trout			
		Silver salmon			
Willamette Falls, Oregon City, Oreg.	June 1–June 30	Shad	710,000		
Cold Springs, Bullochville, Ga.	Entire year	Catfish			4,775
		Rock bass			1,100
		Warmouth bass			1,130
		Large-mouth black bass.			177,825
		Bream or sunfish			17,455
Craig Brook, East Orland, Me.[a]	do	Atlantic salmon		2,079,514	30,003
		Landlocked salmon			16,400
		Humpback salmon		420,986	
		Brook trout		246,000	86,623
Upper Penobscot, Staceyville, Me.	Nov. 26–May 25	Atlantic salmon			
Duluth, Minn.[a]	Entire year	Whitefish		19,900,000	
		Steelhead trout			49,000
		Lake trout	445,000	5,380,000	3,150,000
		Brook trout		100,000	272,600
		Pike perch		9,070,000	
Isle Royale, Mich.	Oct. 28–Nov. 18	Lake trout			
Keweenaw Point, Mich.	Oct. 17–Nov. 18	do			
Marquette, Mich.	Oct. 17–Nov. 8	do			
Ontonagon, Mich.	Oct. 16–Nov. 1	do			
Rossport, Ont.	Sept. 16–Oct. 13	do			
Edenton, N. C.	Apr. 1–May 25	Shad	760,000	41,178,000	
Weldon, N. C.	Apr. 15–May 25	Striped bass		3,061,000	
Erwin, Tenn.	Entire year	Catfish			130
		Carp			221
		Rainbow trout			816,695
		Brook trout			355,000
		Rock bass			4,425
		Small-mouth black bass.			2,125
		Large-mouth black bass.		8,000	7,873
		Bream or sunfish			5,275
		Yellow perch			3 175
Fish Hawk (steamer), Pamlico River, N. C.	Apr. 2–May 10	Shad		25,000	

[a] For convenience in handling, transfers were made as follows:
Central Station to Craig Brook, 30,900 chinook salmon fry and fingerlings.
Clackamas to Nashua, 100,000 chinook salmon eggs.
Clackamas to Duluth, 50,000 steelhead trout eggs.
Eagle and Tanner creeks to Big White Salmon Station, 1,824,670 chinook salmon eggs.
Craig Brook to Nashua, 17,000 brook trout fry and 142,000 brook trout fingerlings.
Duluth to Cape Vincent, 2,306,880 lake trout eggs.

STATIONS OPERATED AND THE OUTPUT OF EACH—Continued.

Station.	Period of operation.	Species handled.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Gloucester Mass.[a]	Entire year	Cod	3,000,000	73,995,000	
		Pollock		66,454,000	
		Flatfish		197,300,000	
		Lobster		21,425,000	
Beverly, Mass	Apr. 10–June 30	do			
Boston, Mass	do	do			
Cohasset, Mass	do	do			
Hull, Mass	do	do			
Marblehead, Mass	do	do			
Plymouth, Mass	Dec. 27–Mar. 24	Cod			
Portsmouth, N. H.	Apr. 10–June 30	Lobster			
Rockport, Mass	do	do			
Green Lake, Me.[a]	Entire year	Landlocked salmon	190,000	255,000	121,511
		Brook trout		1,090,000	
		Lake trout		140,000	
Branch Pond, Me	Sept. 1–Nov. 29	Landlocked salmon			
		Brook trout			
Grand Lake Stream, Me.	Entire year	Landlocked salmon		98,282	
		Brook trout		10,784	
Langdon, Kans.[b]		Catfish			1,995
		Crappie and strawberry bass.			3,150
		Large-mouth black bass.			14,425
		Bream or sunfish			1,710
Leadville, Colo.[a]	Entire year	Landlocked salmon			8,400
		Rainbow trout	15,000	100,000	144,000
		Blackspotted trout	516,380	3,736,000	210,000
		Brook trout	1,233,900	1,905,000	380,500
		Grayling		50,000	
		Golden trout			
Cheesman Lake, Colo.	Apr. 1–May 31	Rainbow trout			
Darrah, Colo	Nov. 5–Nov. 21	Brook trout			
Edith Lake, Colo	Oct. 15–Nov. 16	do			
Eldora Lake, Colo	Oct. 20–Nov. 14	do			
Engelbrechts Lake, Colo.	Oct. 10–Nov. 8	do			
Grand Lake, Colo	July 25–Aug. 31	Blackspotted trout			
Grand Mesa Lakes	July 1–Dec. 15; May 26–June 30.	Rainbow trout			
		Brook trout			
		Blackspotted trout			
Musgroves Lake, Colo.	Oct. 13–Dec. 12	Brook trout			
Ridgways Lake, Colo.	Nov. 17–Dec. 7; Feb. 10–Feb. 12.	Rainbow trout			
		Brook trout			
Twin Lakes, Colo	Nov. 10–Dec. 10	do			
Wellington Lake, Colo.	do	do			
Zoebles Lake, Colo	Oct. 10–Nov. 13	do			
Mammoth Spring, Ark.	Entire year	Rock bass			300
		Small-mouth black bass.		35,000	28,900
		Large-mouth black bass.			33,800
Manchester, Iowa[a]	do	Rainbow trout	350,000		463,550
		Blackspotted trout		1,400	
		Lake trout			8,000
		Brook trout			363,970
		Rock bass			4,450
		Small-mouth black bass.		20,000	2,460
		Pike perch		4,900,000	
Bellevue, Iowa[c]	July 1–Nov. 1	Catfish			45,000
		Crappie and strawberry bass.			40,000
		Large-mouth black bass.			8,400
		Bream or sunfish			48,000
		Buffalo fish			4,500
		Yellow perch			20,000
		Freshwater drum			25,000

[a] For convenience in handling, the following transfers were made:
Gloucester to Woods Hole, 426,000 cod eggs.
Green Lake to other stations, 140,000 landlocked salmon eggs.
Leadville to other stations, 30,000 rainbow trout eggs, 887,720 blackspotted trout eggs, and 600,000 brook trout eggs.
Manchester to other stations, 256,000 rainbow trout eggs.

[b] The fish distributed from Langdon, Kans., were purchased by the Bureau.

[c] Station for the collection of fishes from overflowed lands.

STATIONS OPERATED AND THE OUTPUT OF EACH—Continued.

Station.	Period of operation.	Species handled.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Manchester, Iowa—Con.					
La Crosse, Wis.[a]	July 1–Nov. 1	Catfish			56,475
		Carp			25
		Buffalofish			27,000
		Crappie and strawberry bass.			44,815
		Rock bass			125
		Large-mouth black bass.			70,480
		Pike			5,550
		Bream or sunfish			40,450
		Yellow perch			13,525
		White bass			500
North McGregor, Iowa.[a]	do	Catfish			159,165
		Buffalofish			9,000
		Pike			12,000
		Crappie and strawberry bass.			62,850
		Large-mouth black bass.			88,175
		Rock bass			1,725
		Bream or sunfish			57,875
		Yellow perch			27,900
		Freshwater drum			1,000
Nashua, N. H	Entire year	Chinook salmon			66,000
		Landlocked salmon		32,000	
		Lake trout		114,008	
		Brook trout	30,000	391,000	29,650
		Sunapee trout		191,736	
		Rainbow trout			
		Hybrid trout			
		Small-mouth black bass.		14,750	
Cumberland Center, Me.	Oct. 17–Mar. 17	Brook trout			
Lake Sunapee, N. H	Sept. 15–Nov. 15	do			
		Sunapee trout			
Neosho, Mo.[b]	Entire year	Carp			60
		Rainbow trout			181,115
		Crappie and strawberry bass.			5,142
		Rock bass			7,620
		Small-mouth black bass.			2,000
		Large-mouth black bass.			8,535
		Bream or sunfish			6,000
Northville, Mich.[b]	do	Steelhead trout		21,000	
		Loch Leven trout			12
		Lake trout	2,289,000	20,000	
		Brook trout	50,000	505,000	147,000
		Small-mouth black bass.		2,000	44,825
Alpena, Mich	Feb. 26–May 7	Lake trout		4,480,000	
		Whitefish		30,000,000	
Beaver Island, Mich.	Nov. 4–Nov. 23	Lake trout			
Charlevoix, Mich	Feb. 28–May 2	do		4,441,600	
		Whitefish		25,000,000	
Detroit, Mich.[b]	Entire year	do	31,500,000	47,000,000	
		Pike perch	48,000,000	39,300,000	
Algonac, Mich	Apr. 30–May 27	do			
Bay City, Mich	Apr. 5–Apr. 29	do			
Belle Isle, Mich	Oct. 21–Dec. 7	Whitefish			
Grassy Island, Mich.	Oct. 21–Nov. 28	do			
Sault Ste. Marie, Mich.	Feb. 13–May 28	Lake trout		5,300,000	
		Whitefish		28,000,000	
Put-in Bay, Ohio[b]	Entire year	do	107,766,000	190,000,000	
		Lake cisco	12,790,000	3,200,000	
		Lake trout		897,500	
		Pike perch	169,725,000	80,000,000	
Kelleys Island, Ohio	Nov. 10–Dec. 3	Whitefish			
Middle Bass, Ohio	do	do			
Monroe Piers, Mich	Oct. 24–Dec. 5; Apr. 1–Apr. 19.	do			
		Pike perch			

[a] Station for the collection of fishes from overflowed lands.
[b] For convenience in handling, the following transfers were made:
Neosho to Mammoth Spring, 45,400 rainbow trout eggs and 600 fingerlings.
Northville to other stations and substations, 17,351,600 lake trout eggs.
Detroit to other stations and substations, 130,500,000 whitefish eggs and 16,000,000 pike perch eggs.
Put-in Bay to other stations, 20,000,000 whitefish eggs and 52,000,000 pike perch eggs.

STATIONS OPERATED AND THE OUTPUT OF EACH—Continued.

Station.	Period of operation.	Species handled.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Put-in Bay, Ohio—Con.					
North Bass, Ohio	Nov. 10–Dec. 3	Whitefish			
		Lake cisco	12,790,000	3,200,000	
Pelee Island, Ont.	Nov. 17–Nov. 24	Whitefish			
		Lake cisco			
Port Clinton, Ohio	Nov. 5–Nov. 29; Apr. 6–Apr. 30.	Whitefish			
		Lake cisco			
		Pike perch			
Toledo, Ohio	Apr. 1–Apr. 30	do			
Quincy, Ill	Entire year	(Office headquarters)			
Meredosia, Ill.[a]	July 1–Dec. 12; Apr. 16–June 30.	Catfish			13,465
		Carp			135
		Crappie and strawberry bass.			43,150
		Large-mouth black bass.			109,700
		Bream or sunfish			27,300
		Pike perch		6,700,000	
		Yellow perch			4,525
St. Johnsbury, Vt.[b]	Entire year	Landlocked salmon		36,039	
		Lake trout		134,375	
		Steelhead trout			
		Brook trout	159,000	966,589	
		Small-mouth black bass.		56,862	365
Arlington, Vt	do	Brook trout		36,800	167,100
Chittenden, Vt	Sept. 13–Nov. 30	do			
Darling Pond, Groton, Vt.	Aug. 20–Dec. 12	do			
Lake Mansfield, Stowe, Vt.	Sept. 14–Nov. 23	do			
Lake Mitchell, Sharon, Vt.	Sept. 2–Dec. 12	do			
Swanton, Vt.[b]	Feb. 10–June 3	Pike perch	1,000,000	42,795,000	
		Yellow perch		10,250,000	
San Marcos, Tex	Entire year	Crappie and strawberry bass.			2,938
		Rock bass			2,960
		Warmouth bass			508
		Large-mouth black bass.			53,014
		Bream or sunfish			2,555
Spearfish, S. Dak.[b]	do	Rainbow trout			186,400
		Black-spotted trout	252,000	400,000	642,376
		Loch Leven trout			55,000
		Brook trout			574,300
Schmidts Lake, S. Dak.	Oct. 25–Dec. 31	do			
Thumb of the Lake, Yellowstone Park.	July 1–Aug. 1; June 1–June 30.	Black-spotted trout			
Tupelo, Miss	Entire year	Large-mouth black bass.			3,875
		Bream or sunfish			2,970
		Yellow bass			
White Sulphur Springs, W. Va.	do	Rainbow trout			239,762
		Brook trout			630,506
		Small-mouth black bass.		105,700	2,279
		Large-mouth black bass.			1,890
		Blackspotted trout			
Woods Hole, Mass	do	Cod		119,118,000	
		Flatfish		192,342,000	
		Lobster		25,007,000	
		Tautog		794,000	
Chilmark, Mass	May 15–June 30	Lobster			
Dartmouth, Mass	do	do			
East Greenwich, R. I.	Mar. 9–Apr. 11	Flatfish			
Gay Head, Mass	May 15–June 30	Lobster			
Gosnold, Mass	do	do			
Nantucket, Mass	June 1–June 30	do			
Plymouth, Mass	Nov. 20–Apr. 3	Cod			
Sandwich, Mass	May 15–June 30	Lobster			
Waquoit, Mass	Jan. 21–Apr. 9	Flatfish			

[a] Station for collection of fishes from overflowed lands.
[b] For convenience in handling, the following transfers were made:
St. Johnsbury to other stations, 50,000 brook trout eggs and 345,000 brook trout fry.
Swanton to other stations, 11,000,000 pike perch eggs.
Spearfish to other stations, 504,000 blackspotted trout eggs.

STATIONS OPERATED AND THE OUTPUT OF EACH—Continued.

Station.	Period of operation.	Species handled.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Woods Hole, Mass.—Continued.					
Westport, Mass	May 15–June 30	Lobster			
West Tisbury, Mass	do	do			
Yarmouth, Mass	do	do			
Wytheville, Va.[a]	Entire year	Catfish			16
		Carp			10
		Rainbow trout	265,000		647,018
		Brook trout			143,600
		Rock bass			5,890
		Small-mouth black bass.		500	
		Large-mouth black bass.		16,500	19,470
Yes Bay, Alaska	do	Blueback salmon		61,369,000	

[a] For convenience in handling, there were transferred from Wytheville to other stations 400,000 rainbow trout eggs.

ALLOTMENTS TO STATE FISH COMMISSIONS.

As usual, various state fish commissions were supplied from the Bureau's stock with eggs to be hatched and distributed under their respective auspices. Following is a record of such allotments in 1908:

ALLOTMENTS OF FISH AND EGGS TO STATE FISH COMMISSIONS, FISCAL YEAR 1908.

State and species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
California:			
Chinook salmon	68,647,550		
Colorado:			
Blackspotted trout	125,000		
Lake trout	50,000		
Connecticut:			
Yellow perch		3,500,000	
Idaho:			
Brook trout	100,000		
Illinois:			
Pike perch	25,000,000		
Maine:			
Landlocked salmon	100,000		
White perch	700,000		
Maryland:			
Rainbow trout	150,000		44,800
Yellow perch	2,080,000		
Massachusetts:			
Rainbow trout	15,000		
Lobster		1,475,000	
Michigan:			
Landlocked salmon	10,000		
Lake trout	500,000		
Pike perch	43,000,000		
Missouri:			
Brook trout	100,000		
Grayling	50,000		
Pike perch	5,000,000		
Nebraska:			
Rainbow trout			5,000
Nevada:			
Lake trout	100,000		
Brook trout	200,000		
New Hampshire:			
Chinook salmon	100,000		
Lake trout	504,000		

ALLOTMENTS OF FISH AND EGGS TO STATE FISH COMMISSIONS, FISCAL YEAR 1908—Continued.

State and species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
New York:			
Whitefish	15,000,000		
Landlocked salmon	20,000		
Lake trout	300,000		
Ohio:			
Whitefish	[a] 30,906,000		
Lake cisco	[a] 2,070,000		
Oregon:			
Chinook salmon	1,485,000		
Pennsylvania:			
Whitefish	[b] 76,860,000		
Lake cisco	10,720,000		
Silver salmon	100,000		
Blackspotted trout	126,000		
Lake trout	500,000		
Pike perch	[b] 144,725,000		
Utah:			
Rainbow trout	50,000		
Vermont:			
Lake trout	300,000		
Brook trout	84,500		
Wisconsin:			
Whitefish	15,000,000		
Steelhead trout	50,000		
Rainbow trout	100,000		
Grayling	50,000		
Wyoming:			
Steelhead trout	20,000		
Blackspotted trout	63,000		
Lake trout	50,000		
Grayling	50,000		
Total	440,161,000	4,975,000	49,800

[a] The Ohio Fish Commission cooperated by furnishing a vessel; crew and expenses paid by Bureau.
[b] The Pennsylvania Fish Commission contributed the cost of collecting these eggs.

SHIPMENTS TO FOREIGN COUNTRIES.

A large number of eggs were shipped abroad in 1908, the success of previous efforts to acclimatize American fish, especially salmons and trouts, in foreign countries leading each year to further requests from foreign governments.

SHIPMENTS OF EGGS TO FOREIGN COUNTRIES, FISCAL YEAR 1908.

Country.	Species.	Eggs.
Argentina	Chinook salmon	258,000
	Silver salmon	96,000
	Blueback salmon	75,000
	Steelhead trout	193,725
	Rainbow trout	30,000
	Landlocked salmon	15,000
	Lake trout	75,000
	Brook trout	75,000
	Cod	3,000,000
France	Rainbow trout	20,000
	Blackspotted trout	10,000
Germany	Rainbow trout	100,000
Switzerland	Lake trout	50,000
Total		3,997,725

DETAILS OF DISTRIBUTION OF FISH AND FISH EGGS, FISCAL YEAR 1908.

CATFISH.

Disposition.	Fingerlings, yearlings, and adults.
Alabama:	
Allenton, Bonner's pond	250
Bear Creek, Bear Creek	100
Dadeville, Blue Lake	450
Oil Mill Pond	225
Wilson's pond	225
Eufaula, Guice's lake	225
Guin, Hulsey's pond	100
Hurtsboro, Thigpen's pond	225
Inverness, Pickett's pond	225
Lafayette, Occlagger Creek Pond	225
Opelika, Lyle's pond	225
Shield's pond	450
Spring Pond	225
Seale, Sandfort Pond	225
Sylacauga, reservoir	225
Three Notch, Christian Pond	225
Winfield, Dickinson's pond	100
Arizona:	
Yuma, Colorado River	450
Arkansas:	
Bellefonte, Holmes Pond	200
Fort Smith, Carnall Pond	150
Johnson Pond	150
Lick Pond	150
Uptmoor Pond	150
Hiwasse, Wildcat Pond	100
Colorado:	
La Veta, Shearer's lake	150
Paonia, Hammond's lake	200
Georgia:	
Conyers, Hick's pond	300
Hull's pond	150
Peek's pond	150
Poplar Springs	150
Walker's pond	150
Rabbit, Inland Lake	125
Montgomery's pond	125
Idaho:	
Priest River, Meadow Lake	150
Illinois:	
Carbondale, Dillinger Lake	200
Carterville, Stattlar's pond	200
Naperville, DuPage River	600
Percy, Lightner's lake	200
Savanna, Mississippi River	22,500
Indiana:	
Angola, Lake James	200
Aurora, Sutton's pond	100
Datesville, Loughrey Creek	200
Boonville, Kohler's pond	100
Roetzel's pond	100
Brazil, Campbells Pond	100
Connersville, Gittinger's pond	100
West Fork of White River	100
Cory, Herington's pond	100
Danville, Scearce's pond	50
Dunkirk, Moore's lake	150
Fountain City, Buttonwood Pond	100
Haubstadt, Kruse's lake	100
Knightstown, Blue River	250
Laporte, Stites Pond	300
Lebanon, Goodwin's pond	100
gravel pit	100
Liberty, Davis's pond	100
Milan, Webb's pond	100
Morris, Reuss Pond	100
Pleasant Lake, Kimsey's pond	100
Warren, Smethhurst Pond	100
Wawaka, Pond of the Shades	100
Iowa:	
Baxter, Turkey Lake	150
Belle Plaine, McCandless Pond	100
Bellevue, Mississippi River	22,500
Clayton, Mississippi River	39,500
Fairfield, Fairfield Lake	1,000
Iowa—Continued.	
Lansing, Mississippi River	7,500
Manchester, Maquoketa River	2,000
North McGregor, Mississippi River	71,000
Oskaloosa, Guthrie's pond	150
Sutherland, Frog Pond	150
Youde's pond	150
Wayland, Montgomery's pond	150
Kansas:	
Canada, Siedert's pond	100
Cheney, Walter's pond	50
Garden Plain, Wiske's pond	50
Hutchinson, Truesdell's pond	150
Jetmore, Buckner Creek	300
Leoti, Bluff Lake	150
Harris Pond	100
Marion, Lyons Creek	300
Medicine Lodge, Alexander Lake	30
Case's pond	30
Osage City, Salt Creek	300
Sharon, Cedar Mountain Pond	20
Cole's pond	20
Sharon Valley Pond	20
Wichita, Excelsior Pond	25
Kentucky:	
Auburn, Ragland's pond	100
Bowling Green, Travelstead Pond	100
Cave City, Dorsey's pond	100
Duke's pond	100
Eubank's pond	100
Highland Pond	100
Reynolds Pond	100
Vance's pond	100
Eminence, Rees Pond	150
Franklin, Douglass Pond	200
Drakes Pond	300
Graefts Pond	100
Turner's pond	200
Fredonia, Darrah's pond	200
Glasgow, Dulin's pond	100
Knipp's pond	100
Skeggs's creek	150
Hodgenville, Nolin Creek	450
Hopkinsville, Lake Winona	200
West Fork of Little River	200
Lexington, Pilkinton's pond	100
Louisville, Dogwood Pond	100
McBrayer, Bailey's pond	100
Mayfield, Axsom's pond	100
Beasley's pond	100
Stubblefield's pond	100
Nicholasville, Hollenden Pond	125
Lyne's pond	125
Harris, Ford Lake	250
Pembroke, Big Pond	100
Bland Pond	100
Peewee Valley, Kyce's lake	300
Rocky Hill, Elm Pond	100
Shelbyville, Clear Creek	300
St. Marys, Beaven's pond	200
Sulphur, Coleman's pond	100
Trenton, McChesney's pond	100
Versailles, Rockland Pond	100
Woodburn, Drakes Creek	300
Michigan:	
Cedar City, Bow Lake	250
Delton, Wall Lake	250
Grass Lake, Grass Lake	300
Tims Lake	300
Lakeview, Tamarack Lake	250
Town Line Lake	250
Manitou Beach, Devils Lake	550
Portland, Grand River Pond	250
Prescott, Cranberry Lake	250
Richland, Gull Lake	250

DETAILS OF DISTRIBUTION—Continued.

CATFISH—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Minnesota:	
Alexandria, Geneva Lake	250
Brownsville, Mississippi River	13,500
Mazeppa, Mazeppa Lake	2,000
Mississippi:	
Guntown, Club Spring Pond	150
Hardy Station, Martin's pond	225
Kosciusko, Daniel's pond	275
Lauderdale, Campbell's pond	50
Okolona, Walton's pond	150
Missouri:	
Alma, Clear Pond	100
Anderson, Thief Hollow Springs	100
Brookline, Anderson's pond	100
Columbia, experimental pond	25
Mansfield, Weller's pond	100
Ozark, Finley Creek	100
Wentworth, Elder Pond	100
Montana:	
Butte, Columbia Garden ponds	400
Chouteau County, Marias River	150
Collins, Holm's reservoir	150
Helena, Hauser Lake	300
Sweetgrass, Fitzpatrick's lake	250
Nebraska:	
Lakeside, Tyler Reservoir	100
Orleans, Republican River	550
New Mexico:	
Alamogordo, La Luz Cañon Pond	100
Ancho, Cooper's pond	100
Capitan, Reservoir	100
Cimarron, Pond Creek	200
Cuervo, Sinking Pond	150
Elida, Holme's pond	8
Portales, Allen's pond	15
Burke's ponds	65
Cottonwood Reservoir	15
English Pond	15
Honea Pond	15
Justice's pond	15
Maulden's pond	31
Maxwell Pond	15
Miller's pond	15
Rich's pond	15
Wicks Pond	15
San Marcial, Brown's reservoir	200
Silver City, Gila River	150
New York:	
Cooperstown, Canadarago Lake	60
North Dakota:	
Devils Lake, Cavanaugh Lake	250
Devils Lake	1,250
Ellendale, Shimmin's pond	200
Ohio:	
Cygnet, Swope's pond	100
Georgetown, Silver Lake	100
Smithfield, Hoyle's pond	150
Wooster Spring Pond	100
Oklahoma:	
Alva, Rams Lake	8
Jackson's lake	8
Sollers Pond	8
Ames, Alfalfa Spring Pond	25
Apache, Robinson Pond	50
Deer Creek, Forsythe's pond	25
Doxey, Indian Creek Pond	25
Spring Pond	25
Willow Pond	25
Comanche County, Freeland's pond	50
Elgin, Red Pond	42
Enid, Laporte's pond	25
Myers Pond	25
Erick, Gilchrist's pond	25
Fay, Big Noses Creek	25
Shortman's creek	25

Disposition.	Fingerlings, yearlings, and adults.
Oklahoma—Continued.	
Garber, Harris Pond	75
Geary, Edenview Pond	30
Glencoe, Estes Pond	150
Guthrie, Aspe's pond	150
Beland's pond	125
Kieffer's pond	125
Redington Lake	200
Severin's pond	125
Twin Lake No. 2	250
Henessey, Baker's pond	30
Hooper, Hancock Reservoir	15
Kingfisher, Danne's pond	30
Marshall, Conklin Pond	50
Meeker, Sebastian's pond	100
Mountain Park, Spring Pond	50
Muldrow, Gresham's pond	100
Ringwood, Paine's pond	50
Sayre, Long Creek Pond	25
Stillwater, Davis Pond	150
Yost Lake	150
Temple, Clearview Pond	50
Tyrone, Spring Pond	15
Waukomis, McGuires Pond	30
Schauer's pond	30
Wheaton, Meyer's pond	50
South Dakota:	
Draper, McGillvra's pond	275
Faulkton, Pulaski Pond	250
Highmore, Willow Pond	150
Clarkston, Coffee Creek	300
Presho, Ketchum's pond	400
Stevens Lake	475
Stoops' pond	300
Swinson's pond	300
Reliance, Bartholow's pond	200
Clear Pond	600
Fletcher's pond	150
Lake Russell	150
Rockham, Stapp's pond	200
Vivian, South Draw Dam	150
White Lake, Clear Lake	250
Tennessee:	
Cumberland City, Bayer's pond	100
Hendersonville, Berry's pond	210
Lewisburg, Grindstone Pond	100
McKenzie, New's pond	100
Mountain City, Furnace Creek	100
Murfreesboro, Dyer's pond	300
Tennessee City, Rogers Pond	100
Texas:	
Sherman County, Pottinger's pond	15
Virginia:	
Amherst, Winston's pond	100
Bealeton, Willowbrook Pond	100
Bedford City, Arrington Branch	100
Charlottesville, Ravanna River	200
Covington, Jackson River	16
Danville, Morelock Lake	150
Dillwyn, Elam's pond	100
Gala, James River	100
Glasgow, Lake Lawn Pond	100
Martinsville, Doe Run	100
Ringgold, River Bend Pond	100
Rockcastle, Finch's pond	150
Washington:	
Addy, Colville River	250
Colville, Lake View	250
Leavenworth, Smith's lake	125
Spokane, McCrackens Pond	200
Wenatchee, Okanagan River	300
Wisconsin:	
Beaver Dam, Beaver Dam Lake	450
Genoa, Mississippi River	7,500
LaCrosse, Mississippi River	16,100
Manawa, Union Mill Pond	600

DETAILS OF DISTRIBUTION—Continued.

CATFISH—Continued.

Disposition.	Fingerlings, yearlings, and adults.	Disposition.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.		Wyoming—Continued.	
New Lisbon, Lemonweir River	450	Hulett, Prickley Pear Lake	150
Prairie du Chien, Mississippi River	30,000	Storm's Lake	200
Wyoming:		Moorecroft, Bell Fouche Lake	250
Cheyenne, Lake Minnehaha	250	Newcastle, Mush Creek Reservoir	300
Cody, Spring Brook	250	Total [a]	277,601
Gilette, Simpson Reservoir	200		

CARP.

Alabama:		North Carolina:	
Greensboro, Whitsett Lake	25	Taylorsville, Adams Pond	25
Arkansas:		Tennessee:	
Magnolia, Stevens Pond	30	Bears Springs, Sexton's pond	130
Illinois:		Virginia:	
Noble, Frohning's pond	15	Abingdon, Grubb's pond	40
Maryland:		Groseclose, Kegley's pond	10
Berlin, Trappe Mill Pond	25	Wytheville, Cassell's pond	25
Missouri:			
Columbia, experimental pond	25	Total [b]	350

BUFFALOFISH.

Illinois:		Minnesota:	
Savanna, Mississippi River	2,250	Brownsville, Mississippi River	4,750
Iowa:		Wisconsin:	
Bellevue, Mississippi River	2,250	Genoa, Mississippi River	8,500
Clayton, Mississippi River	4,500	La Crosse, Mississippi River	5,250
Lansing, Mississippi River	8,500		
North McGregor, Mississippi River	4,500	Total	40,500

SHAD.

Disposition.	Eggs.	Fry.	Disposition.	Eggs.	Fry.
District of Columbia:			North Carolina—Cont'd.		
Washington, Basin of Potomac River		600,000	Plymouth, Roanoke River		573,000
Maryland:			Pollocksville, Trent River		600,000
Accokeek Creek at mouth, Potomac River		1,915,000	Scotch Hall, Albemarle Sound		1,767,000
Battery Haul, Chesapeake Bay		9,814,600	Tyner, Chowan River		970,000
Broad Creek at mouth, Potomac River		1,625,000	Washington, Pamlico River		25,000
Chase, Gunpowder River		450,000	Wilmington, Cape Fear River		600,000
Pamunkey Creek at mouth, Potomac River		3,389,000	Oregon:		
Piscataway Creek at mouth, Potomac River		4,591,000	Oregon City, Willamette River		710,000
Swan Creek at mouth, Potomac River		1,978,000	South Carolina:		
North Carolina:			Catawba, Catawba River		600,000
Avoca, Albemarle Sound	75,000	7,328,000	Cheraw, Peedee River		600,000
Capehart's Shore, Albemarle Sound	150,000		Dillon, Little Peedee River		600,000
Edenton, Albemarle Sound		20,670,000	Georgetown, Black River		600,000
Edenton Bay	195,000	1,677,000	Virginia:		
Fayetteville, Cape Fear River		600,000	Dogue Creek at mouth, Potomac River		2,722,000
Mackey Ferry, Albemarle Sound	340,000		Little Hunting Creek at mouth, Potomac River		2,858,000
Maysville, White Oak River		600,000	Occoquan Bay, Potomac River		3,571,000
Merry Hill, Albemarle Sound		2,793,000	Pohick Creek at mouth, Potomac River		3,890,000
			Walkers, Chickahominy River		600,000
			Total	760,000	79,316,600

[a] Lost in transit, 3,930 fingerlings.

[b] Lost in transit, 101.

Details of Distribution—Continued.

WHITEFISH.

Disposition.	Eggs.	Fry.
Michigan:		
Belle Isle, Detroit River		47,000,000
Charlevoix Reef, Lake Michigan		10,000,000
Detour, Lake Huron		8,000,000
Escanaba, Green Bay		1,000,000
Fishermans Home, Lake Superior		4,100,000
Fox Island Reef, Lake Michigan		5,000,000
Grace Harbor, Lake Superior		2,400,000
Lake Ann, Lake Ann		350,000
Manistique, Lake Michigan		1,000,000
Marquette, Lake Superior		4,200,000
North Point, Lake Huron		17,500,000
Ontonagon, Lake Superior		4,200,000
Point Iroquois, Upper St. Mary's River		2,000,000
Sand Bay Reef, Lake Michigan		5,000,000
Scarecrow Island, Lake Huron		12,500,000
Skilligallee Reef, Lake Michigan		4,750,000
St. Marys River, Great Lake George		4,000,000
Whitefish Point, Lake Superior		12,000,000
Minnesota:		
Duluth, Lake Superior		100,000
Susie Island, Lake Superior		2,400,000
New York:		
Bear Point, Lake Ontario		5,500,000
Constantia, New York Fish Commission	15,000,000	
Cooperstown, Otsego Lake		480,000
New York—Continued.		
Fox Island, Lake Ontario		9,500,000
Fullers Bay, Lake Ontario		1,000,000
Grenadier Island, Lake Ontario		11,200,000
New York City, New York Aquarium	1,000,000	
Point Peninsula, Lake Ontario		8,000,000
Stony Point, Lake Ontario		3,000,000
Wilsons Bay, Lake Ontario		6,000,000
Ohio:		
Catawba Island, Lake Erie		20,000,000
Isle St. George, Lake Erie		15,000,000
Kelleys Island, Lake Erie		45,000,000
Middle Bass Island, Lake Erie		10,000,000
Port Clinton, Lake Erie		30,000,000
Put-in Bay, Lake Erie		60,000,000
Ohio Fish Commission	30,906,000	
West Sister Island, Lake Erie		10,000,000
Pennsylvania:		
Erie, Pennsylvania Fish Commission	76,860,000	
Virginia:		
Jamestown, Jamestown Exposition	500,000	
Wisconsin:		
Aminicon River, Lake Superior		2,400,000
Oshkosh, Wisconsin Fish Commission	15,000,000	
Total [a]	139,266,000	384,480,000

LAKE CISCO.

Disposition.	Eggs.	Fry.
Ohio:		
Put-in Bay, Lake Erie		3,200,000
Ohio Fish Commission	2,070,000	
Pennsylvania:		
Erie, Pennsylvania Fish Commission	10,720,000	
Total	12,799,000	3,200,000

[a] Lost in transit, 100,000 fry.

Details of Distribution—Continued.

CHINOOK SALMON.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
California:			
Baird, McCloud River		4,780,855	
Brookdale, Santa Cruz County Fish Hatchery	1,000,000		
Eel River, California Fish Commission	7,154,200		
Sisson, California Fish Commission	56,493,350		
New Hampshire:			
Laconia, New Hampshire Fish Commission	100,000		
Lake Sunapee, Lake Sunapee			30,000
Tilton, Lake Winnisquam			18,000
Weirs, Lake Winnepesaukee			18,000
New York:			
New York City, New York Aquarium	20,000		
Oregon:			
Clackamas, Clackamas River		2,894,800	457,805
Elgin, Oregon Fish Commission	1,485,000		
Findley Eddy Station, Limpey Creek		845,000	170,051
Illinois River Station, Illinois River		3,664,025	
Rancheree Creek		400,000	
Rogue River Station, Elk Creek		41,002	
The Dalles, Seuferts Lakes		600,000	
Wedderburn, applicant	1,830,000		
Virginia:			
Jamestown, Jamestown Exposition	45,000		
Washington:			
Baker Lake Station, Baker Lake		430,245	
Big White Salmon, Columbia River			387,337
Spring Creek			570,804
Birdsview, Phinney Creek		12,000	
Skagit River		56,064	
Cooks Landing, Columbia River		2,300,000	320,000
Little White Salmon, Columbia River			60,000
Little White Salmon River		4,670,000	199,800
Underwood, Columbia River		4,304,194	
Argentina:			
Buenos Aires, Argentine Government	258,000		
Total	68,385,550	24,998,185	2,231,797

SILVER SALMON.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
California:			
Brookdale, Santa Cruz County Hatchery	100,000		
Oregon:			
Clackamas, Clackamas River			57,932
Findley Eddy Station, Limpey Creek		85,000	
Rogue River Station, Elk Creek		68,000	
Wilderville, Applegate River		5,000	
Pennsylvania:			
Pleasant Mount, Pennsylvania Fish Commission	100,000		
Washington:			
Baker Lake Station, Baker Lake		9,681,000	
Lower Baker River		800,000	
Birdsview, Baker River		35,000	
Skagit River		2,686,714	
Grandy Creek		20,000	
Jackman Creek		40,000	
Argentina:			
Buenos Aires, Argentine Government	96,000		
Total	296,000	13,420,714	57,932

BLUEBACK SALMON.

Disposition.	Eggs.	Fry.	Disposition.	Eggs.	Fry.
Alaska:			Argentina:		
Yes Bay, Yes Lake		16,869,000	Buenos Aires, Argentine Government	75,000	
Yes River		44,500,000			
Washington:			Total	75,000	69,883,305
Baker Lake Station, Baker Lake		8,456,145			
Birdsview, Skagit River		58,160			

Details of Distribution—Continued.

HUMPBACK SALMON.

Disposition.	Fry.	Disposition.	Fry.
Maine:		Maine—Continued.	
Augusta, Kennebec River	43,750	South Orrington, Mill Creek	10,000
Brunswick, Androscoggin River	81,250	Waterville, Kennebec River	100,000
Bucksport, Dead Brook	10,000	Washington:	
Small Brooks	10,000	Baker Lake Station, Baker Lake	76,165
East Orland, Alamoosook Lake	25,986	Birdsview, Grandy Creek	2,553,500
North Bucksport, Hurds Brook	10,000	Skagit River	3,605,097
Oldtown, Penobscot River	100,000	Phinney Creek	530,000
Orland, Orland River	20,000		
Phillips Brook	7,500	Total	7,185,748
Stovers Brook	2,500		

STEELHEAD TROUT.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Michigan:			
Munising, Cleveland Cliffs Iron Co	50,000		
Muskegon, Lake Muskegon		14,000	
Minnesota:			
Deerwood, Bay Lake			16,000
St. Peter, Lake Henry			16,000
Montana:			
Norris, Lake Madison			10,000
New York:			
Auburn, Owasco Lake		19,550	
Oregon:			
Clackamas, Clackamas River		15,000	
Illinois River Station, Rancheree Creek	20,000	19,700	
Rogue River Station, Elk Creek		670,360	
Rogue River		247,620	
Washington:			
Birdsview, Day Creek		35,456	
Grandy Creek		51,460	
Skagit River		50,000	
Wisconsin:			
Lampson, Steelhead Lake			17,000
Woodruff, Wisconsin Fish Commission	50,000		
Wyoming:			
Sheridan, Howard Eaton	20,000		
Argentina:			
Buenos Aires, Argentine Government	193,725		
Total [a]	333,725	1,123,146	59,000

RAINBOW TROUT.

Arkansas:			
Monte Ne, Monte Ne Lake			500
Rogers, Prairie Creek			7,500
Sulphur Springs, Butter Creek			10,000
Colorado:			
Alma, Mosquito Creek			6,000
Wheeler Lake			6,000
Bailey, Deer Creek			5,000
Basalt, Frying Pan River			7,500
Buffalo, Lake Cheesman			30,000
Cliff, Platte River			5,000
Cripple Creek, Mount Pisgah Pound			5,000
Eldora, Lake Eldora			10,000
Grand Mesa Lakes, Ward Lake		100,000	
Grant, Platte River and Geneva Creeks			10,000
Lyons, Estes Park Protective Association	100,000		
Miramonte, Carter Lake			8,000
Newmire, Middle Bear Creek			4,000
Norrie, Frying Pan River			15,000
Shawnee, Platte River			5,000
South Platte, South Platte River			10,000
Victor, Beaver Lake			6,000

[a] Lost in transit, 7,000 fry.

DETAILS OF DISTRIBUTION—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Delaware:			
Bellevue, Holly Oak Pond			800
Georgia:			
Clarksville, Chickamauga Creek			8,000
Dillard, Barker Creek			4,000
Deltys Creek			4,000
Big Creek			4,000
Pine Gap Creek			4,000
Wolf Fork Creek			4,000
Yarber Creek			4,000
Yuke Creek			4,000
Gainesville, Tralida Lake			3,000
Tate, West Branch Long Swamp Creek			6,000
Wise Creek			5,000
Young Harris, Brasstown Creek			8,000
Idaho:			
Kendrick, Dales Pond			500
Priest River, Priest Lake			3,000
Priest River			3,000
Troy, Anderson's pond			1,000
Indiana:			
Culver, outlet of Lake Maxinkuckee			750
South Bend, Rupels Lake			100
Iowa:			
Chester, South Fork Beacon Creek			15,000
Manchester, Maquoketa River			10,000
Spring Branch			5,550
Postville, Spring Brook			2,000
Waterville, Little Paint Creek			15,000
Paint Creek			15,000
Waukon, North Fork Yellow River			15,000
Regan Creek			14,600
Silver Creek			15,000
Village Creek			15,000
Maryland:			
Baltimore, Maryland Fish Commission	150,000		----------
Forest Hills, Long Branch			1,500
Hagerstown, Maryland Fish Commission			44,800
Rocky Ridge, Turkey Run			1,000
Stevenson Station, Cross's pond			1,190
Massachusetts:			
Sutton, Massachusetts Fish Commission	15,000		----------
Michigan:			
Alanson, Rileys Creek			300
Crystal Falls, Paint River			2,000
Wingleton, Pere Marquette River			5,975
Minnesota:			
Preston, Watson Creek			28,000
Rochester, Bear Creek			20,000
St. Charles, Branch Whitewater Creek			20,000
St. Peter, Noonan's creek			15,000
Paul's creek			15,000
Spring Valley, Spring Valley Creek			20,000
Stockton, Rolling Stone Creek			20,000
Winona, Rolling Stone Creek			50,000
Missouri:			
Arnett, Cooper's pond			1,200
Aurora, Little Crane Creek			500
Silver Lake			2,000
Spring River			19,250
Turnback Creek			5,750
Billings, Goose Creek			4,500
Bourbon, Blue Springs			5,000
Brown Springs, Spring Creek			250
Clever, Silver Lake			500
Collins, Boren's pond			1,500
Crane, Crane Creek			4,250
Wilson Creek			4,000
Hurley, Carneys Creek			850
Elm Spring			2,000
Spring Creek			10,850
Spring River			8,000
Marionville, Honey Creek			5,500
Polk Springs			5,000
Mount Vernon, Cherry Creek			5,000
Tritt's creek			5,000

DETAILS OF DISTRIBUTION—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Missouri—Continued.			
Neosho, Ball's spring			1,000
Hickory Creek			90
McMahon Spring			1,500
Rawlings Branch			4,000
Newburg, Mill Creek Springs			3,000
Purdy, Flat Creek			17,500
Joy Creek			1,500
Racine, Buzzard's pond			1,500
Republic, Silver Lake			1,000
St. James, Meramec Spring			5,000
Schlichts, Schlichts Spring			5,000
Sparta, Finley Creek			3,200
Springfield, Pearsons Creek			10,000
Sullivan, Rainbow Lake			10,000
Montana:			
Anaconda, Warm Spring Creek			6,000
Butte, Columbia Garden ponds			10,700
Harlem, Lodge Pole Creek			2,000
Lewistown, Fork of Flat Willow Creek			5,000
tributary of Cottonwood Creek			1,000
Marion, Deakin's lake			1,500
Moore, Rainbow Lake			1,000
Neihart, Lost Fork Judith River			3,000
Norris, Meadow Creek			4,000
Noxon, Pilgrim			3,000
Nebraska:			
Chadron, Big Bordeaux Creek			7,000
Chadron Creek			400
Gretna, Nebraska Fish Commission			5,000
New York:			
Addison, Canisteo River			30,700
Albany, Stevens Lake			750
Vlykill Creek			1,200
Battery Park, New York Aquarium	10,000		
Cambridge, Batten Kill Creek			900
Long Lake West, Wolf Pond			4,000
Raquette Lake, Applicant	60,000		
Yosts Station, Briggs Creek			1,500
North Carolina:			
Asheville, Big Ivy Creek			10,000
Black Mountain, North Fork Creek			6,000
North Fork Swannanoa			6,000
Swannanoa Creek			8,000
Brevard, Capheys Creek			9,000
Bryson City, Alarka Creek			1,600
Bridge Creek			2,000
Deep Creek			2,800
Indian Creek			2,400
Nantahala River			4,000
Nettle Creek			3,000
Cranberry, Linville River			7,850
Elk Park, Elk River			7,900
Etowah, Browns Creek			6,000
Foering, Cooper's creek			600
Newtons Mill Creek			600
Oconalufta River			600
Greensboro, Rice's pond			1,200
Hendersonville, Big Hungry Creek			8,600
Green River			8,000
Little Hungry Creek			600
Mills River			800
Huntdale, Bald Creek			600
Lake Toxaway, Fairfield Lake			4,200
Lake Toxaway and tributaries			164,700
Toxaway River			5,000
Whitewater River			1,200
Lenoir, headwaters of New River			8,000
Marion, Bald Creek			1,000
Bear Creek			4,000
Bee Rock Creek			1,500
Boiling Creek			4,000
Burgin Creek			1,000
Camp Rock Creek			2,500
Crib Creek			2,000
Curtis Creek			3,000
Duncan Cone Creek			1,000
Harris Creek			4,000

DETAILS OF DISTRIBUTION—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
North Carolina—Continued.			
Marion, Lick Log Fork Creek			1,000
Limekiln Creek			6,000
Little River			3,000
Lost Cove Creek			2,000
Dewberry Fork Creek			4,000
North Fork Creek			8,000
Oil Mill Creek			5,500
Paddys Creek			3,000
Page Branch			4,000
Pepper's creek			2,500
Pink Branch			4,000
Raborns Fork Creek			4,000
Reedy Fork Creek			2,000
Roaring Fork Creek			2,500
Singed Cat Creek			1,000
Sixmile Creek			1,000
Thompsons Fork Creek			2,500
Walnut Cove Creek			1,000
Yourk Branch			4,000
Mortimer, Lost Cove Creek			18,000
Wilson Creek			19,800
Murphy, Blairs Creek			4,000
Brasstown Creek			7,000
Dick Walker Creek			4,000
Downings Creek			4,000
Frier Creek			8,900
Hiawassee River			10,000
Hyatt's mill pond			6,000
Long Branch			5,000
Quall's creek			4,000
Rock House Creek			900
Shooting Creek			8,000
Sweetwater Creek			4,000
Town Creek			4,000
Tusquittee Creek			8,000
Nantahala, Otter Creek			600
Parkersburg, Salters Lake			10,000
South River			600
Pisgah Forest, Davidson River			3,600
Poplar, Cold Springs			1,500
Quebec, Flat Creek			6,000
Kings Creek			4,000
Saginaw, Linville River			7,700
Selica, Cathers Creek			4,000
Spruce Pine, Beaver Creek			5,000
Graveyard Creek			5,000
Toecane, Bean Creek			500
Triumph, Pockolet Creek			8,000
Waterville, Big Creek			5,000
Waynesville, Bald Creek			4,000
East Fork Pigeon River			1,800
Henry Hill Creek			5,000
Hyatts Branch			4,000
Middle Fork Pigeon Creek			5,000
Rocky Branch			5,000
Scotts Creek			5,000
Soco Creek			5,000
Wesser, Nantahala River			10,000
Silver Creek			6,000
Wesser Creek			6,000
Zirconia, Green River			10,000
Oregon:			
Ashland, Lake of the Woods		5,000	
Baker City, Goodrich Lake		6,000	
Carlton, Meadow Lake		8,000	
Haines, Eilertsen pond		3,000	
North Powder Lake		3,000	
Red Mountain Lake		6,000	
Hood River, Little Creek		4,000	
Odell Creek		3,000	
Spring Creek		3,000	
La Grande, Beaver Creek		9,000	
Five Points Creek		9,000	
Grande Ronde River		9,900	
Meadow Creek		4,000	
Upper Grande Ronde		7,950	
Medford, Big Battle Creek		12,000	

DETAILS OF DISTRIBUTION—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Oregon—Continued.			
Mosier, Rock Creek		5,000	
North Powder, Black Lake		4,000	
Oregon City, Milk Creek		4,000	
Molalla River		8,000	
Pendleton, McKay Creek		5,950	
Meacham Creek		5,950	
Umatilla River		11,900	
Woodburn, Cedar Brook Pond		3,000	
Pennsylvania:			
Ackermanville, Large Greenwalt Creek			2,400
Austin, East Fork Sinnemahoning River			1,500
Prouty River			1,000
Benton, Coles Creek			2,000
Brookville, Clear Creek			1,600
Mill Creek			1,600
North Fork Creek			2,400
Chambersburg, Birch Run			3,000
Carbaugh Run			1,750
East Branch Falling Spring			1,000
Falling Spring			1,000
Hoosic River			1,750
Coudersport, Lent Brook			1,000
Lents Ponds			1,000
Cresco, Bushkill Creek			9,300
Hellan, Locust Spring			1,000
Holliday, Crooked Creek			5,000
Hollidaysburg, Beaver Dam Creek			1,200
Loop Run			1,200
Oldtown Run			1,200
Muddy Creek, Toms Creek			1,000
New Bethlehem, Locust Lake			800
Oak Hall, Spring Creek			1,500
Rising Springs, headwaters Penns Creek			2,500
Rockwood, Millers Run			1,600
Sand Patch, McKenzie's pond			800
Susquehanna, Starrucca Creek			11,200
Williamsburg, Canoe Creek			1,500
Schmuckers Creek			1,500
South Carolina:			
Pickens, Little Eastatoee Creek			5,800
Saluda Creek			5,800
Walhalla, Cain Creek			5,600
Conecross River			2,200
South Dakota:			
Dewey, Main Beaver Creek			200
Elmore, Spearfish Creek			45,000
Englewood, Elk Creek			1,000
Hill City, Newton Creek			10,000
Spring Creek			25,000
Iron Creek, Iron Creek			10,000
Maurice, Squaw Creek			10,000
Nahant, branch of Rapid Creek			15,000
Spearfish, Falsebottom Creek			1,200
Spearfish Creek			21,700
Spring Branch Pond			1,000
Spring Creek			1,000
Whitewood, Richards Pond			4,000
Tennessee:			
Arthur, Gap Creek			4,000
Blevins, Tiger Creek			6,300
Bluff City, Weavers Branch			1,500
Whites Branch			1,500
Campbell Junction, Campbell Junction Pond			1,300
Cleveland, Bakers Creek			8,000
Indian Creek			6,000
Doe, Shoun's spring			2,900
Double Springs, Fowler's lake			2,000
Erwin, Lake McInturff			800
Martins Creek			8,000
North Indian Creek			85,400
Fishery, Indian Creek			195
North Indian Creek			11,000
Gallatin, Cocke's pond			7,700
Hampton, Doe River			5,150
Laurel Fork Creek			12,200
Simerley Creek			7,900
Tourell Fork Creek			7,900
Hartford, Mill Creek			3,025
High Cliff, Rose's lake			2,900

DETAILS OF DISTRIBUTION—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Tennessee—Continued.			
LaFollette, Spring Creek			2,950
Livingston, Collins Mill Pond			1,000
Medina, Mathis Pond			2,000
Mountain City, Furnace Creek			600
Niota, Limestone Pond			700
Powell Station, Godfrey's pond			800
Roan Mountain, Doe River			17,850
Hampton Creek			4,700
Heaton Creek			4,800
Wilson Creek			4,400
Rockwood, Lake Madge			1,300
Sparta, Officer's pond			8,000
Unaka Springs, Grassey Creek			19,000
Wales, Richland Creek			10,000
Waverly, Trace Creek			12,000
Utah:			
Carters Station, Box Elder Springs Pond			3,000
Murray, Utah Fish Commission	50,000		
Salt Lake City, applicant	5,000		
Spring Creek Pond			6,000
Sugar Station, applicant	50,000		
Vermont:			
Proctor, Beaver Pond			1,050
Virginia:			
Abingdon, Beaver Creek			1,000
Brumley Creek			3,000
Cedar Creek			10,500
Fifteenmile Creek			4,800
Geislers Creek			3,500
Greendale Creek			1,500
Hog Thief Creek			7,000
Holston River, tributaries			180,000
Hughes Creek			7,600
Knob Creek			6,000
Logan Creek			400
Moccasin Creek			3,200
North Fork Creek			1,000
Smith's creek			2,000
Spring Creek			8,400
Tooles Creek			8,800
Town Creek			13,000
Wolf Creek			18,000
Appalachia, Carters Creek			3,000
Bonsack, Spring Branch			3,000
Buena Vista, Lynchburg Springs			2,000
Cedar Brook, Opequan Creek			3,000
Damascus, Spring Creek			7,500
Straight Branch			10,000
Fairwood, Wilson Creek			5,200
Farmville, Stanley Park Pond			1,150
Grottoes, Big Branch			625
Moormans River			2,000
Paines Run			2,000
Imboden, Pigeon Fork Creek			6,400
Keokee, Big Crab Orchard Creek			2,500
Little Crab Orchard Creek			2,500
Long Rock Branch			2,500
Langley, Scotts Run			325
Leesburg, Limekiln Pond			900
Marion, Stahley Creek			14,000
Meadow View, Logan Creek			8,000
White Rock Creek			4,800
Wolf Creek			4,000
Mount Jackson, Smith Creek			13,300
Natural Bridge, Cedar Creek			4,800
Neersville, Neersville Creek			2,500
Pembroke, Little Stony Creek			2,500
Mountain Lake			2,500
Rocky Point, Roaring Run			1,200
Salem, Masons Creek			3,000
Saltville, Red Creek			9,600
Somerset, Cole's pond			450
Staunton, Crawford's branch			12,000
Glen Run			8,000
Winchester, Opequan Creek			2,000
Wytheville, Cove Creek			10,000
North Fork Reed Creek			15,000
Reed Creek			768

Details of Distribution—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Washington:			
Baker, Hermit's lake		5,800	
Boundary, Cedar Lake			1,500
South Fork Cedar Creek			2,000
Collins, Whalen Creek Pond		1,600	
Milan, Otter Creek			3,000
Newport, Lake Leo			2,000
Nighthawk, Toates Coulee Creek			4,000
Pomeroy, Borus Creek		5,600	
Walla Walla, applicant	140,000		
Wilbur, Wilbur Creek			1,500
West Virginia:			
Bevington, Spring Run			4,200
Bluefield, Spring Lake			2,500
Bunker Hill, Brook Run			3,000
Mill Creek			3,000
Charlestown, Everets Run			2,500
Drakesville, Middle Creek			6,800
Davis, Blackwater River			6,000
Gassoway, Elk River			21,600
Halltown, Flowing Spring Run			3,600
Harding, Gandy Creek			15,650
Inwood, Back Creek			837
Mill Creek			4,800
Martinsburg, Opequan Creek			720
Tuscarora Creek			14,000
Montrose, Spring Pond			1,700
North Mountain, Tules Creek			1,700
Pocahontas County, Deer Creek			800
Seebert, Cranberry Creek			2,400
White Sulphur Springs, Cove Creek			10,000
Lewis Brook			8,000
Wisconsin:			
Arcadia, Waumandee River			20,000
Bloomer, Duncan Creek			10,000
Kendall, Lumsden Creek			2,000
Madison, Wisconsin Fish Commission	100,000		
Menomonie, Hay River			15,000
Lambs Creek			10,000
Wilson Creek			15,000
Merrillan, Arnold Creek			8,000
Mosinee, branch of Wisconsin River			4,000
Plymouth, Onion River			4,000
Soperton, Otter Creek			4,000
Thorp, Carpenter Creek			2,000
Goggle Eye Creek			2,000
Tomahawk, Wind Pudding Lake			4,000
Trempealeau County, Fox Creek			10,000
Tamarack Creek			34,000
Wheeler, Sink Creek			2,000
Wyoming:			
Sheridan, Pond Lily Lake			10,000
Surprise Lake			10,000
Yellowstone National Park, East Fork Gardiner River			200
Gibbon River			10,000
Yellowstone Lake, tributary			3,700
Argentina:			
Buenos Aires, Argentine Government	30,000		
France:			
Bellefontaine, French Government	20,000		
Germany:			
Berlin, German Fisheries Society	100,000		
Total [a]	830,000	253,650	2,713,600

ATLANTIC SALMON.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Maine:			
Brownville, Penobscot River			30,003
Oakfield, East Branch of Mattawamkeag River		20,000	
Penobscot County, Little Spring Brook		100,000	
Penobscot River		1,959,514	
Total		2,079,514	30,003

[a] Lost in transit, 6,950 fry and 23,640 fingerlings.

DETAILS OF DISTRIBUTION—Continued.

LANDLOCKED SALMON.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Colorado:			
Twin Lakes, Twin Lakes			8,400
Idaho:			
Hope, Pend d'Oreille Lake			6,000
Maine:			
Bangor, Brewers Pond			1,500
Bar Harbor, Long Pond		10,000	
Belfast, Swan Lake			1,500
Bingham, Pierce Pond			2,000
Rowe Pond		4,543	
Bryant, Christopher Lake		5,500	
Twitchells Lake		5,500	
Caribou, Maine Fish Commission	50,000		
Dedham, Branch Pond		35,000	5,000
Green Lake		21,000	41,000
Dixfield, Weld Pond		9,025	
East Orland, Craig Pond			1,200
Patten Pond			1,300
Toddy Pond			3,300
East Wilton, Pease Pond		9,500	
Ellsworth, Beech Hill Pond			1,500
Farmington, Big Island Pond			1,500
Clearwater Lake			5,950
Franklin, Little Pond			1,200
Molasses Pond			2,400
Freyburg, Keiser Lake			2,000
Grand Lake Stream, Dobsis Lake		10,000	3,165
Grand Lake		88,282	23,971
Greenville Junction, Maine Fish Commission	50,000		
Holden, Fitz Pond			1,200
Houlton, Nickerson's lake			1,875
Kennebunk, Kennebunk Pond			2,000
Kingman, Pleasant Lake		9,350	1,500
Livermore Falls, Round Pond		9,500	
Locke Mills, Twitchell Lake			1,250
Oquossoc, Parmachenee Club	15,000		
Rangeley Lake			4,500
Otis, Green Lake		50,000	1,540
Palermo, Branch Mill Pond		9,500	
Perry, Bordens Lake		10,000	
Phillips Lake, Phillips Lake		12,000	
Portage, Portage Lake			6,375
Rockland, Chickawaukie Lake		7,500	2,400
Lemonds Pond			1,600
Mirror Lake			1,500
Rumford Falls, Howards Lake		9,025	
Searsport, Swan Lake			2,000
Skowhegan, Lake George		9,350	
Somerset County, Bakers Pond		2,457	
Tunk Pond, Tunk Pond			2,000
Union, Crawfords Pond			1,000
Round Pond			1,000
Waterville, East Pond			1,500
West Ellsworth, Pattens Pond		10,000	
West Paris, Big Concord Pond			1,000
Shagg Pond			1,000
Massachusetts:			
Pocasset, Tahanto Club	5,000		
Michigan:			
Munising, Cleveland Cliffs Iron Co	10,000		
Sault Ste. Marie, Michigan Fish Commission	10,000		
New Hampshire:			
Meredith, Lake Winnepesaukee		10,000	
Newton Junction, Silver Lake			1,200
Pike, Lake Tarleton			1,200
Potter Place, Johnson's pond			1,000
Pleasant Lake		12,000	
Weir, Lake Winnepesaukee		10,000	
New York:			
Horseshoe, Lake Manan		14,250	
Old Forge, New York Fish Commission	20,000		
Pleasant Lake, Pleasant Lake		14,250	
Raquette Lake, applicant	15,000		
Vermont:			
Greensboro, Caspian Lake		26,039	
Essex County, Little Averill Lake		10,000	

Details of Distribution—Continued.

LANDLOCKED SALMON—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Washington:			
Bellingham, Lake Whatcom		7,710	
Argentina:			
Buenos Aires, Argentine Government	15,000		
Total [a]	190,000	441,281	151,526

BLACKSPOTTED TROUT.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Arizona:			
Flagstaff, Liveoak Creek		6,000	
Rock Creek		6,000	
Jerome, Beaver Creek		3,000	
Cedar Creek		3,000	
Oak Creek, branch		3,000	
Sycamore Creek		6,000	
Colorado:			
Aspen, Castle Creek		15,000	
Hunters Creek		15,000	
Maroon Creek		20,000	
Taylor River		25,000	
Antonito, Conejos River		20,000	
Bailey, South Platte River		8,000	
Berry's Ranch, Eagle Creek			12,000
Boulder, Outing Club's lake		8,000	
Buena Vista, Cottonwood Creek		25,000	
Cottonwood Lake		25,000	
North Cottonwood Creek		25,000	
Cascade, Caecados Creek			10,000
Cebolla, Cebolla Creek		30,000	
Gunnison River		35,000	
Cimarron, Blue River		20,000	
Little Blue River		20,000	
applicant	25,160		
Clyde, East Beaver River		20,000	
Middle Beaver River		40,000	
Colorado City, Palmer's pond			25,000
Debeque, Cottonwood Creek		10,000	
Cottonwood Lake No. 4		10,000	
Cottonwood Reservoir		10,000	
Mesa Creek			24,000
Del Norte, Francisco Creek		10,000	
Tienas Creek		30,000	
Delta, Spring Creek		25,000	
Delta County, Anthracite and Coal Creeks		100,000	
Dirty George Creek		25,000	
Kaiser Creek		25,000	
Surface Creek		25,000	
Ward Creek		25,000	
Dolores, Dolores River		35,000	
Durango, Naegelin's lake		10,000	
Eagle, Triangle Creek Pond			14,000
Eldora, Lake Eldora		16,000	
Fairplay, Middle Fork			
South Platte River		15,000	
Sacramento Creek		15,000	
Twelvemile Creek		15,000	
Fort Collins, Cache la Poudre River, North Fork		30,000	
upper		45,000	
Creedmore Lake		20,000	
Lone Pine Creek		30,000	
Georgetown, Lake Cunningham		13,889	
Lake Hunt		13,888	
Silver Dollar Lake		13,889	
Granby, Eightmile and Indian creeks		15,000	
Fish Creek		10,000	
Frazer River		15,000	
Grand Lake		20,000	
North Inlet		15,000	
Grand River		15,000	
East Fork		10,000	
North Fork		15,000	
Upper		15,000	

[a] Lost in transit, 16,250 fry and 785 fingerlings.

DETAILS OF DISTRIBUTION—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Colorado—Continued.			
Grand Lake. Corral Creek		15,000	
Grand Lake, North Inlet		40,000	
West Branch		25,000	
Grand River		80,000	
North Fork		20,000	
South Fork		20,000	
Stillwater Creek		15,000	
Strawberry Creek		15,000	
Strawberry Lake		10,000	
Willow Creek		15,000	
Grand Mesa Lakes, Alexander Lake		20,000	
Barren Lake		110,000	
Carp Lake		25,000	
Twin Lakes		90 000	
Grant, Platte River		105,000	
Gunnison, Colorado Fish Commission	125,000		
Gypsum, Sweetwater Lake			14,000
Hartselle, South Platte River			25,000
Hopkins Spur, Beaver Dam Lake			12,000
Idaho Springs, Beaver Dam Creek		13,889	
Chicago Creek		13,889	
Fall River		13,889	
Mill Creek		13,889	
Millers Lake		13,889	
Slaters Lake		13,889	
Iola, Gunnison River		35,000	
Ivanhoe, Frying Pan River		25,000	
Ivanhoe Lake and Creek		25,000	
Kline, Bohannon's lakes		120,000	
La Jara, Conejos River		20,000	
Lake City, Lake Fork Gunnison River		25,000	
Larson Gulch Creek		10,000	
Mill Creek		10,000	
Larimer County, North Fork Cache la Poudre River		12,000	
La Veta, Crater Lake		10,000	
Leadville, Arkansas River, lower		10,000	
upper		15,000	
Colorado Gulch Pond		4,000	
Half Moon Creek		20,000	
Lake Creek, lower		85,000	
upper		15,000	
Rock Creek		10,000	
Turquoise Lake		10,000	
Loveland, Big Thompson River		28,000	
Estes Park Protective Association	266,560		
Osborn Lake		8,000	
Lyons, St. Vrain River		112,000	
Minturn, Eagle River			26,000
Moffat, Saguache Creek		30,000	
Monarch, South Fork Grand River		15,000	
Monta Vista, Middle Fork Alamosa River		10,000	
Newcastle, South Fork White River			18,000
Norrie, North Fork Frying Pan River		25,000	
Ouray, Haskins Pond		10,000	
Rollinsville, Los Lagos Lake		10,000	
Ruedi, Hough's pond		5,000	
Ruedi Creek		10,000	
Sapinero, West Elk Creek		15,000	
Shawnee, South Platte River		40,000	
Snow Spur, Dolores River		15,000	
Sulphur Springs, Grand River		40,000	
Williams Fork River		25,000	
Tabernash, Ranch Creek		15,000	
Thomasville, Fellows Lake		10,000	
Lime Creek		25,000	
Spring Creek		10,000	
Woods Lake		100,000	
Wagon Wheel Gap, Rio Grande		105,000	30,000
Westcliff, Lake of the Clouds		20,000	
North and South Colony Creek		20,000	
Woodland Park, West Monument Lake		15,000	
Idaho:			
Bonner County, Meander Lake			6,000
Bonners Ferry, Flemming Creek			12,000
Lenia, Herrmann's lake			12,000
Priest River, Skookum Creek			6,000
Rathdrum, Spirit Lake			7,000

Details of Distribution—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Idaho—Continued.			
Sand Point, Homestead Lake			12,500
Troy, Appelquist's lake			7,000
Montana:			
Anaconda, Eureka Pond			6,000
Mountain View Springs			6,000
Arlee, Jacko Creek			10,000
Belgrade, Story Creek			5,000
Belt, Belt Creek			24,000
Big Sandy, Eagle Creek			10,000
Blaine, Lynch Creek			11,500
Bonita, Rooster Creek			3,500
Ranch Creek			7,000
Rock Creek			12,000
Welcome Creek			7,000
Boulder, North Fork Little Boulder River			7,000
Bozeman, Clear Spring Pond			3,000
Spring Creek			5,000
Butte, Columbia Garden Pond			26,000
Collins, Teton River			15,000
Columbus, Stillwater River			36,000
Craig, Bazel Creek			5,000
Bear Creek			5,000
Bickel Creek			5,000
Cottonwood Creek			5,000
Middle Fork Creek			5,000
Smith Fork Creek			5,000
Stickney Creek			8,000
Wood Creek			5,000
Deer Lodge, Clear Creek			3,000
Dorsey, Upper Sixteen Mile Creek			8,000
Emigrant, Strawberry Creek			4,000
Fort Benton, Highwood Creek			10,000
Gallatin County, Bridger Creek			9,000
Helena, Beaver Creek			18,000
Trout Creek			5,000
Lewistown, Beaver Creek			10,000
East Fork Big Spring Creek			25,000
Flat Willow Creek			12,000
Fords Creek			10,000
Marcott Creek			7,000
Rock Creek			10,000
Lima, Big Sheep Creek			10,000
Livingston, Jordan's trout pool			3,000
Logging Creek, Logging Creek			15,000
Martinsdale, Checkerboard Creek			5,000
Daisy Dean Creek			8,000
White Tail Deer Creek			3,500
Mitchell, Sheep Creek Pond			2,000
Monarch, Dry Fork Black Creek			8,000
Dry Fork Wolf Creek			5,000
Tillinghast Creek			5,000
Neihart, Belt Creek			15,000
Carpenter Creek			3,000
Cleveland Creek			7,000
Hoover Creek			4,000
Pilgrim Creek			5,000
Tenderfoot Creek			6,000
Weatherwax Creek			8,000
Pony, Park Lake			3,000
Scribner, Pryor View Pond			3,000
Summit, Warm Spring Creek			3,000
Toston, Sixmile Creek			4,000
Troy, Emerald Lake			6,000
Sapphire Lake			6,000
Nebraska:			
Chadron, Bordeaux Creek			15,000
New Mexico:			
Chama, Los Pinos River		120,000	
Glorieta, Pecos River		60,000	
Las Vegas, Gallinas River		20,000	
Trout Springs		20,000	
Onava, Lake Isabelle		25,000	
Raton, Paint Creek		25,000	
Ponil Creek		25,000	
Rayado River		30,000	
Spring Branch		10,000	
Rowe, Bull Creek		25,000	

DETAILS OF DISTRIBUTION—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
New Mexico—Continued.			
San Marcil, Nogal Canyon Creek		9,000	
Silver City, Gila River		15,000	
Vermejo, Leandro Creek		10,000	
Ricardo Creek		10,000	
Vermejo River		15,000	
Oregon:			
Ashland, Reeser's lake		4,980	
Dilley, Tualatin River		3,000	
Gold Hill, Rogue River, tributary		4,990	
Medford, Four Bit Creek		5,000	
North Fork Big Butte Creek		5,000	
Milwaukee, Crystal Lake		7,500	
Oregon City, Cedar Creek		5,500	
Dicky Creek		2,000	
Molalla River		8,000	
Russell Creek		3,500	
Trout Creek		3,000	
Rogue River Station, Elk Creek		28,170	
Seaside, Necanicum Creek		5,000	
Wimer, Evans Creek		5,000	
Pennsylvania:			
Pleasant Mount, Pennsylvania Fish Commission	126,000		
South Dakota:			
Custer, French Creek			25,000
Deadwood, Miller Pond			10,000
Dewey, Lower Beaver Creek			20,000
Hill City, Hill Creek			3,000
Iron Creek			9,500
Spring Creek			35,000
Iron Creek, Beaver Creek			7,500
McGees Mill, Prairie Creek			9,000
Maurice, Squaw Creek			5,500
Mystic, Rapid Creek			25,776
Newark, Lake Artesia		600	
Oreville, White Horse Creek			2,500
Pactola, Rapid Creek			9,000
Piedmont, Elk Creek			15,000
Little Elk Creek			7,500
Pluma, Bear Butte Creek			7,500
Elk Creek			7,500
Reesburg Branch			10,000
Rapid City, Cleghorn Springs			9,000
North Side Park Pond			7,500
Rapid Creek			9,000
Rochford, Rapid Creek			50,000
Rosebud Agency, Rock Creek			10,000
Rosebud Creek			5,000
Sisseton, Long Hollow Creek		800	
Spearfish, Chicken Creek			7,500
Cox Lake			7,500
Crow Creek			10,000
Higgins Gulch Creek			3,500
Spearfish Creek			92,100
Summers Creek			7,500
Water Cress Creek			15,000
Sturgis, Bear Butte Creek			7,500
reservoir			8,000
Spring Pond			7,500
West Nahant, North Fork Rapid Creek			17,000
Utah:			
Heber, Spring Creek		10,000	
Provo, Provo River		200,000	
Salt Lake City, Ogden River		50,000	
Snyderville, Spring Creek		25,000	
Virginia:			
Jamestown, Jamestown Exposition	59,630		
Washington:			
Marysville, Tulalip Creek		2,000	
Milam, Knesters Lake			6,000
Silvana, Lake Goodwin		3,000	
Skamania County, Mausolau Lake		3,000	
Toketee Lake		2,000	
Spokane, Horse Shoe Lake			31,000
Tacoma, Bowers Creek		1,500	
Waitsburg, Touchet River		3,000	
Walla Walla, Mill Creek		5,000	
applicant		30,030	

Details of Distribution—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wyoming:			
Aladdin, Beaver Creek			7,500
Basin, Shell Creek			27,000
Trapper Creek			30,000
Beulah, Montana Lake			7,500
Sand Creek			30,000
Buford, Lone Tree Creek		18,000	
Casper, King Creek			7,500
Cowley, Gyp Creek			6,000
Dale Creek, Dale Creek		30,000	
Eothen, Beaver Creek			15,000
Ranchester, applicant	63,000		
Rock River, Rock River		24,000	
Sheridan, Rapid Creek			17,000
Wyoming Fish Commission	63,000		
Yellowstone National Park, Duck Lake		175,000	
Fisheries Creek		225,000	
France:			
Bellefontaine, French Government	10,000		
Total[a]	768,380	4,230,540	1,442,376

LOCH LEVEN TROUT.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Michigan:			
Detroit, Belle Isle Aquarium			12
South Dakota:			
Savoy, Little Spearfish Creek			55,000
Total			55,012

LAKE TROUT.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Colorado:			
Denver, Colorado Fish Commission	50,000		
Indiana:			
South Milford, Pretty Lake		20,000	
Maine:			
Dedham, Green Lake		60,000	
East Wilton, Pease Pond		12,500	
Farmington, Varnums Pond		12,500	
Hartland, Moose Pond		14,259	
Morrill Pond		14,260	
Skowhegan, Lake George		26,481	
Michigan:			
Charlevoix, Lake Michigan		1,440,000	
Detour, Lake Huron		1,600,000	
Detroit, Belle Isle Aquarium	10,000		
Eagle Harbor, Lake Superior			320,000
Escanaba, Big Bay De Noquet		150,000	
Fishermans Shoal, Lake Michigan		1,488,300	
Fish Island, Lake Superior		320,000	806,000
Irishmans Ground, Lake Michigan		1,488,300	
Isle Royale, Lake Superior		320,000	80,000
Lake Ann, Woodcock Lake		25,000	
Manistique, Lake Michigan		150,000	
Marquette, Lake Superior		700,000	
Munising, applicant	200,000		
North Point, Lake Huron		1,500,000	
Ontonagon, Lake Superior		1,080,000	360,000
Paris, Michigan Fish Commission	500,000		
Point Iroquois, Upper St. Marys River		800,000	
Sault Ste. Marie, St. Marys River		800,000	
Scarecrow Island, Lake Huron		2,980,000	
Tobins Harbor, Lake Superior		960,000	
Washington Harbor, Lake Superior			820,000
Whitefish Point, Lake Superior		1,800,000	

[a] Lost in transit, 12,000 fingerlings and 18,530 fry.

DETAILS OF DISTRIBUTION—Continued.

LAKE TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Minnesota:			
Duluth, Lake Superior			54,000
Beaver Bay, Lake Superior		320,000	
French River, Lake Superior		360,000	
Grand Marais, Lake Superior			170,000
Grand Portage, Lake Superior		320,000	
St. Joseph, Big Fish Lake			20,000
Susie Island, Lake Superior		320,000	
Two Harbors, Lake Superior		678,000	
Waconi, Clearwater Lake			8,000
Nevada:			
Verdi, Nevada Fish Commission	100,000		
New Hampshire:			
Coos County, First Connecticut Lake		36,875	
Hancock, Lake Nubunusit		30,000	
Laconia, New Hampshire Fish Commission	504,000		
Littleton, Forest Lake		25,000	
Manchester, Shirley Lake		10,000	
Wiers, Lake Winnepesaukee		49,008	
New York:			
Auburn, Owasco Lake		30,000	
Bemus Point, New York Fish Commission	300,000		
Charity Shoals, Lake Ontario		659,170	
Childwold, Lake Massawepic		25,000	
Cooperstown, Otsego Lake		9,475	
Dutch Point, Lake Ontario		220,590	
Fox Island, Lake Ontario		1,246,065	
Green Lake, Stewart Lake		25,000	
Grenadier Island, Lake Ontario		1,795,705	
Hemlock, Canadice Lake		25,000	
Hemlock Lake		30,000	
Point Peninsula, Lake Ontario		220,590	
Prospect, Big Rock Lake		25,000	
Raquette Lake, applicant	45,000		
Richfield Springs, Lake Conadarago		25,000	
Ohio:			
Kelleys Island, Lake Erie		897,500	
Oregon:			
Haines, Rock Creek Lake			4,980
Pennsylvania:			
Susquehanna, Stearns Lake		25,000	
Union City, Pennsylvania Fish Commission	500,000		
Vermont:			
Averill, Great Averill Lake		37,500	
Barton, Stone Pond		10,000	
Willoughby Lake		40,000	
Island Pond, Echo Pond		10,000	
Roxbury, Vermont Fish Commission	300,000		
Washington:			
Bellingham, applicant	50,000		
Silver Lake			4,990
Maple Falls, Silver Lake			5,000
Medical Lake, Otter Lake			5,000
Vancouver, Vancouver Lake			4,110
Wisconsin:			
Iron River, Lake Superior			160,000
Sand Island, Lake Superior			160,000
Wyoming:			
Ranchester, Wyoming Fish Commission	50,000		
Argentina:			
Buenos Aires, Argentine Government	75,000		
Canada:			
Rossport, Lake Superior			200,000
Switzerland:			
Berne, Swiss Government	50,000		
Total[a]	2,734,000	25,267,078	3,182,080

[a] Lost in transit, 2,000 fry and 30 fingerlings.

Details of Distribution—Continued.

BROOK TROUT.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Alabama:			
Athens, Sugar Creek			10,000
Arizona:			
Tucson, Sabine Creek			1,400
Colorado:			
Amethyst, applicant	443,900		
Aspen, Columbine Lake			4,000
Snow Mass Lake			4,000
Willow Lake			4,000
Bailey, Platte River		15,000	
South Platte River		45,000	15,000
Basalt, Bates Lake		7,000	
Frying Pan River			15,000
Otto Creek			10,000
Breckenridge, Deep Blue Lake			4,000
Buena Vista, South Cottonwood Creek			3,000
Buffalo, Lake Cheesman		50,000	
Wellington Lake		200,000	
Cebolla, Lower Gunnison River		20,000	
Cimarron, Cimarron River		15,000	
Highpark Lake		8,000	
Lake No. 7		4,000	
Colorado Springs, Broadmoore Lake		8,000	
Cheyenne Lake		10,000	
Fersman Lake			3,000
Lake Moraine		20,000	
Portland Mill Reservoir			3,000
Prospect Lake		15,000	
Rustic Home Reservoir			3,000
Seven Lakes Reservoir		20,000	
Williams Lake		15,000	
Younger Springs Lake		11,000	
Creede, Lime Creek		12,000	
Lime Creek Lake		10,000	
Red Mountain Lake		12,000	
Cripple Creek, Mount Pisgah Pond			3,000
Del Norte, Rio Grande		24,000	
Lone Rock, South Platte River		20,000	
Empire, West Branch, Clear Creek		12,000	
Florissant, Lake George			5,000
Granby, Bowen Creek			8,000
Columbine Creek			5,000
Grand Lake		50,000	
East Inlet			8,000
Grand River		25,000	
Strawberry Creek			5,000
Grant, North Fork Platte River		20,000	
Platte River			12,000
Grover, Oasis Lake			8,000
Gunnison, Nichols Lake			4,000
Hartsel, South Fork South Platte River		45,000	15,000
Hillside, Bush Creek		19,000	
Idaho Springs, Chicago Creek		12,000	
Lake Edith		75,000	
Insmont, North Fork South Platte River		20,000	
Iola, Elk Creek		25,000	
Ivanhoe, Ivanhoe Lake and Creek		15,000	8,000
Jefferson, Baker Lake		15,000	
La Jara, California Gulch Springs		6,000	
Coombs Pond			2,000
Neff's pond		3,000	
Leadville, Arkansas River, lower		12,000	
upper		12,000	
Darrah's lake		25,000	
Halfmoon Creek		12,000	
Lake Creek, lower		12,000	
upper		12,000	
Musgroves Lake		350,000	
Sugar Loaf Reservoir		50,000	
Tennessee Creek		15,000	
Turquoise Lake		15,000	
Willow Creek		12,000	
Llangollen, Stearn's lake			4,000
Lyons, Big Thompson River		25,000	
Estes Part Protective Association	300,000		
Little Fork St. Vrain River		16,000	
North Fork St. Vrain River		51,000	

DETAILS OF DISTRIBUTION—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Colorado—Continued.			
Malta, Smith's pond			7,500
Montrose, Beckman Lake		5,000	
Jarvis Pond		8,000	
Spring Creek		8,000	
Whites Branch		4,000	
Nast, Frying Pan River		45,000	50,000
Norrie, Frying Pan River		20,000	27,000
Pinegrove, Elk Creek		15,000	
Ridgeway, Beaver Creek			2,000
Dallas River			2,000
Rollinsville, Grand River			15,000
Lake Manchester			3,000
Salida, Miklich Addition Pond		12,000	
Ridgeway Ponds		20,000	
Spring Pond No. 5			3,000
Shawnee, North Fork South Platte River			10,000
Thomasville, Lime Creek		20,000	10,000
North Fork, Frying Pan River			15,000
Woods Lake		40,000	
Tolland, Lake Tolland			8,000
South Boulder Creek		25,000	15,000
Twin Lakes, Twin Lakes		75,000	3,000
Victor, Oil Creek			5,000
Wagonwheel Gap, Bellows Creek		8,000	
Ward, Overland Lake			1,500
West Cliff, Deweese Reservoir		50,000	
Weston, Russell's lake			3,000
Woodland Park, Beaver Creek			5,000
Connecticut:			
East Thompson, Sheldon's pond			3,000
Goodspeeds, Beebe Brook			3,000
Groton, Fourmile River			3,000
New Canaan, Lockwood Creek			320
Roxbury, Carey Brook			625
Georgia:			
Clayton, Timpson Creek Pond			1,500
Dillard, Kelleys Creek			4,000
Rabungap, Walnut Creek			8,000
Idaho:			
Ahsahka, North Fork, Clearwater River			3,000
Athol, Lewalin Creek			1,000
Bellevue, Idaho Fish Commission	100,000		
Bonner County, Freeman Lake			800
Greer, Lola Creek			2,000
Musselshell Creek			1,500
Kamiah, Lawyers Creek			2,000
Kooskia, Clear Creek			2,000
Middle Fork, Clearwater River			3,000
Lewiston, Deer Creek			2,000
Ellis Pond			500
Market Lake, Anderson's pond			500
Green's pond			500
Raymond's pond			500
Moscow, Caroll Creek			1,200
Hatter Creek			1,200
Little Potlach River			2,000
Meadow Creek			1,000
Palouse River			2,000
North Lapwai, Hatwai Creek			1,200
Lapwai Creek			2,000
Orofino, Breakfast Creek			2,000
Fords Creek			1,500
Whiskey Creek			1,500
Peck, Big Canyon Creek			2,000
Little Canyon Creek			2,000
Post Falls, Spokane River			2,000
Rathdrum, Fish Lake Creek			1,500
Spalding, Webb Creek			2,000
Stites, Big Cedar Creek			1,500
Meadow Creek			1,500
Sweetwater, Mission Creek			1,500
Troy, Bear Creek			1,500
Potlach River			4,000
Ruby Creek			1,000
Illinois:			
Belvedere, Belvedere Trout Pond			500
Cary Station, Coldspring Pond			500
McNett's creek			1,200

Details of Distribution—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Indiana:			
Crawfordsville, Lye Creek Pool			2,500
Indianapolis, Crystal Spring			2,500
Russiaville, Crystal Spring			2,500
Iowa:			
Cresco, Coldwater Creek			1,200
Decorah, Canoe Creek			2,500
Lansing, Spring Creek			1,500
McGregor, Sni Magil Creek			1,800
Manchester, Spring Branch			8,000
Waterville, Hansom Creek			1,500
Waukon, Coon Creek			1,500
French Creek			1,500
Larson Creek			1,500
Paint Creek			1,500
Patterson Creek			3,000
Silver Creek			1,800
Village Creek			2,500
Yellow River			2,500
Winnesheik County, Coldwater Creek			2,000
Pine Creek			2,000
Kentucky:			
Spring Station, Big Spring Branch			1,000
Maine:			
Alfred, Nutter's pond		20,000	
Augusta, Lake Cobbosseecontee			3,072
Bar Harbor, Eagle Lake		25,000	
Bar Mills, Clearspring Pond			768
Bethel, B Pond			1,025
Biddeford, Buzzell Brook		5,000	
Bingham, Rowe Pond		27,371	
Bryants Pond, Indian Pond			1,024
Burnham, Reynolds Brook			1,000
Twelvemile Creek			1,000
Camden, Canaan Lake		50,000	
Hobbs Pond		25,000	
Norton Lake		65,000	
Canton, Lake Anasagunticook			1,500
Cumberland Center, Rowe Pond			9,980
Cumberland Junction, Redrock Pond			1,024
Spring Brook			1,152
Sturdivant's pond			768
White Brook			1,280
Dedham, Branch Pond		50,000	
Phillips Lake		50,000	
East Brownfield, Little Saco Creek			896
East Wilton, Pease Pond			1,500
Ellsworth, Alligator Lake		40,000	
Blunts Pond			1,500
Cloughs Pond			1,500
Pattens Pond		50,000	
Farmington, King and Bartlett Lakes			1,500
Sucker Brook			1,000
Tuffts Pond		2,500	
Franklin, Little Pond		20,000	
Narragaugus Pond		40,000	
Grand Lake Stream, Dobsis Lake		2,892	
Dyer Cove Brook		2,500	
Farm Brook		2,892	
Ox Brook		2,500	
Greenville Junction, Moosehead Lake		50,000	
Hancock County, Tunk Pond		19,000	
Indian Pond, Indian Pond		5,335	
Jackman, Hatchery Brook		5,000	
Kineo, Moosehead Lake		50,000	2,500
Landers, Lake Moxie			3,500
Livermore Falls, Long Pond		20,000	
Locke Mills, North Pond			896
Round Pond			1,920
South Pond			2,048
Mainstream, Everns Pond		15,000	
Ocean Side, Donnell Brook			768
Oquossoc, Rangeley Lakes		50,000	
Otis, Green Lake		198,000	
Perry, Boyden Lake		40,000	
Portage, Portage Lake			1,000
Portland, Ocean Pond			256
Presque Isle, Echo Lake		40,000	

DETAILS OF DISTRIBUTION—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Maine—Continued.			
Rangeley, Gull Pond			1,500
Rangeley Lake		25,000	
Richmond, Baker Pond			1,500
Jimmy Pond			1,500
Rockland, Branch Brook		18,000	
Canaan Lake		50,000	
Chickawaukie Lake		25,000	
Mirror Lake			2,000
Rockville Brook			1,300
Searsport, Swan Lake		50,000	
Skowhegan, Hayden Lake			1,500
Somerset County, Lake Moxie		12,449	
South Paris, Marshall Pond			1,024
Lake Pennesseewassee		36,000	
Springdale, Mousam Lake			2,048
Steep Falls, Mayo Lake			768
Union, Sennebec Pond			1,000
Unity, Unity Pond		40,000	
Waldo, Ellis Creek		15,000	
Waldoboro, Medomak River		25,000	
Parker Pond		25,000	
Waterville, China Lake			1,000
West Paris, Abbot Pond			1,024
Dickson Pond			1,024
Little Concord Pond			1,024
Overset Pond			1,024
Washburn Pond			768
Maryland:			
Adamstown, Big Spring Branch			500
Buck Lodge, Walldene Branch			1,800
White's branch			2,000
Cockeysville, Paper Mill Branch			500
Ballston, Butchers Run			500
Garrett County, Laurel Run			1,500
Highland, Cool Spring Branch			600
Hollins, Green Spring Branch			700
Loch Raven, Newport Run			500
Monkton, Conrads Branch			500
Pleasant Valley Branch			500
Mountain Lake Park, Mountain Lake			1,500
Oakland, Brownings Dam			500
Lake Bryan			500
Lake Rosanna			460
Piney Lake			500
Trout Run			500
Thurmont, High Run			600
Hunting Creek			1,800
Mountain Creek			400
Watervale, Ashtin's pond			500
Backeson's branch			500
Massachusetts:			
Greenfield, Bumingtons Pond			1,000
Hinsdale Brook			750
Huntington, Brookside Pond			500
Northampton, Long Plain Brook			750
Welch Brook			625
Sandwich, applicant	30,000		
Topsfield, Alder Brook			1,200
Waltham, tributary Stony Brook			3,000
Williamsburg, Highland Brook			625
Pinegrove Pond			500
Michigan:			
Addison, Posey Creek		10,000	
Baldwin, Baldwin Creek			5,000
Branch Pere Marquette River			2,000
Sweetwater Creek			2,000
Battle Creek, Helmer Brook			5,000
Mingus Brook			5,000
Sevenmile Brook			5,000
Bellaire, Cedar River			5,000
Branch, Wilson Creek			5,000
Clare, Clear Creek		10,000	
North Branch Tobacco River		10,000	
Corunna, Crooked Creek		10,000	
Farwell, Tobacco Creek			5,000
Fenton, Buttermilk Creek			1,400
Gaylord, Pigeon River			10,000

DETAILS OF DISTRIBUTION—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Michigan—Continued.			
Gladwin, Cedar River		10,000	
Grayling, Tillula Lake		10,000	
Greenville, Berridges Creek		10,000	
Hart, Cedar Creek		10,000	
Hunter's creek		10,000	
Pentwater River		10,000	
South Branch Pentwater River		10,000	
Highwood, Black Creek		10,000	
Hillsdale, Happy Hollow Pond		5,000	
Honor, Coulton and Behlkie creeks			5,000
Iron County, Iron River			3,000
Lake Ann, Ransom Creek			2,000
Lewiston, Hunt Creek		10,000	
Lovells, Big Creek		25,000	
Muskegon, Cedar Creek		10,000	
Cleveland Creek		10,000	
Springbrook Pond		10,000	
Northville, tributary River Rouge		5,000	
Omer, Rifle River		30,000	
Oxford, Pine Creek		10,000	
Owosso, Hardy Creek		10,000	
Maple River		10,000	
Willow Brook		10,000	
Peacock, branch Au Sable River			5,000
Sand Creek and Mud Lake			5,000
Rapid City, Rapid River			10,000
Torch Lake		10,000	
Rollins, Brittons Creek			5,000
Dillons Creek			5,000
Roscommon, Downing Creek		20,000	
South Branch Au Sable River		5,000	10,000
Rose Center, Buckhorn Creek		10,000	
Gordon Creek			1,500
Traverse City, Acme Creek			1,200
Vanderbilt, Sturgeon River			10,000
Vermontville, Herring Creek		10,000	
Washington Harbor, Washington Creek			10,000
Watersmeet, High Lake		8,000	
Wingleton, Dannaher Creek			7,500
Pickerel Creek			7,500
Wolverine, Sturgeon Bay			10,000
Minnesota:			
Caledonia, Winnebago Creek			8,000
Canton, Weisels Creek			2,000
Winches Creek			2,000
Drummond, Sargent Creek			10,000
Duluth, Beaver Creek			15,000
Caribou Creek			15,000
Rice River			10,000
Excelsior, Trout Lake			10,000
Kellogg, McDonalds Spring			500
Trout Brook			500
Lake City, Miller's creek			500
Lewiston, Enterprise Creek			1,442
Ferguson Valley Creek			886
Guenther Valley Creek			1,500
Stockton Valley Creek			1,500
Mabel, Belleville Creek			500
Geigers Creek			500
Halls Creek			700
Newberg Creek			1,000
Riceford Creek			2,000
Sherbons Creek			500
Plainview, Beaver Creek			515
East Indian Creek			1,032
Middle Creek			515
West Indian Creek			1,032
Preston, branch of Forestville Creek			600
Camp Creek			1,000
Partridge Creek			700
Trout Run			1,000
Willow Creek			1,000
Proctor, Rocky Run			12,000

DETAILS OF DISTRIBUTION—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Minnesota—Continued.			
Rochester, Spring Brook			12,000
Rushford, Beeland Creek			500
Camp Creek			500
College Creek			500
Daly's creek			500
Enterprise Creek			500
Gribben Creek			500
Hemmingway Creek			500
Iverson Creek			500
Johnson's creek			500
Meade Creek			700
Nepstad Creek			500
Onsline Creek			500
Ophrem Creek			500
Overland Creek			500
Pine Creek			800
Rush Creek			800
Trout Run			606
Vaggen Creek			500
Wiscoy Creek			700
Short Line Park, Russell Rapids			8,000
Spring Valley, Deer Creek			1,500
Etna Branch			1,000
Kingsley Creek			500
Mahood Creek			500
North Branch			500
Spring Valley Creek			800
St. James, branch of Watanwan Creek			2,500
Winona, Campbell Creek			500
Dabblestein Valley Creek			500
Gordon Valley Creek			1,000
Hauser Valley Creek			1,000
Home Creek			500
Johnson Valley Creek			500
Knapp Valley Creek			500
Pusha Valley Creek			700
Speltz Valley Creek			1,500
Voelker Valley Creek			500
Missouri:			
Cuba, applicant	15,000		
St. Joseph, Missouri Fish Commission	100,000		
Montana:			
Anaconda, Warm Spring Creek			3,000
Armstead, Spring Creek			500
Belt, Belt River			500
Big Sandy, Big Sandy Creek			2,000
Godfrey Creek			1,000
Bonita, Kitchen Creek			800
Rock Creek			2,000
Boulder, fork of Little Boulder River			4,000
Bozeman, Fowler's pond			1,000
Hoffman's ponds			2,500
Spring Creek			5,000
Williams Pond			5,000
Williamson's pond			1,500
Butte, Columbia Garden ponds			21,700
Chouteau County, Marias River			2,200
Columbus, Rosebud River			2,000
Forsythe, Coldspring Lake			500
Gallatin County, Bridger Creek			8,000
East Gallatin Creek			7,000
Gardiner, Glen Creek			21,600
Willow Creek			14,400
Havre, Box Elder Creek			2,000
Helena, Beaver Creek			4,000
Hinsdale, Cash Creek			600
Kalispell, Conrads Creek			400
Viano Creek			1,000
Lewistown, Armells Creek			3,900
Big Spring Creek			1,200
Casino Creek			1,500
Darley's pond			500
Lima, Meadow Spring			400

Details of Distribution—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Montana—Continued.			
Logging Creek, Pilgrim Creek			2,000
Martinsdale, Musselshell River			1,000
Spring Creek			5,000
Trout Lake			1,000
Moore, Galbraith Creek			600
Neihart, Belt Creek			2,500
Carpenter Creek			1,500
Norris, Odell Creek			5,000
Sheridan, Indian Creek			5,000
Toston, Spring Creek Lake			5,000
Twin Bridges, Beaverhead Pond			5,000
White Sulphur Springs, Checkerboard Creek			5,000
Woodville, Lake Palmer			1,000
Nebraska:			
Chadron, Big Bordeaux Creek			10,800
Chadron Creek			1,000
Crawford, Spring Run			12,600
Gretna, Potter Creek			500
Nevada:			
Verdi, Nevada Fish Commission	200,000		
New Hampshire:			
Berlin, Success Pond		15,000	
Bradford, Meetinghouse Brook		4,000	
Canaan, Croff Brook			300
Indian River			600
Mascoma River			1,400
Orange Brook			600
Claremont, Blow-Me-Down Brook		10,000	
Tooles Brook		5,000	
Cole Brook, applicant	50,000		
Concord, Bear Creek			1,000
Beaverdam Brook			300
Bow Brook Pond			300
Cronley's pond		5,000	
Stumpfield Brook			300
Whiterock Creek			700
Durham, Demerritt Brook			300
Endfield, Bicknell Brook			800
Committee Meadow Brook			600
Exeter, Severence Brook			300
Spring Brook		10,000	
Franklin, Call Brook		5,000	
Gulf Brook		10,000	
Mountain Brook		5,000	
Putney Brook		4,000	
Gorham, Mascot Lake		6,000	
Grafton, Baldmeadow Brook			400
Hoyt Brook			300
Groverton, Slide Brook			500
Stratford Brook		10,000	
Hillsboro, Craige Brook		5,000	
Ellinwood Brook		5,000	
Island Pond		4,000	
Hinsdale, Adams Creek			400
Hooker Brook			400
Hookset, Pinegrove Pond		3,000	
Jefferson, Law's pond		3,000	
Keene, Beaver Brook		7,000	
East Branch Ashuelot River			800
Ferry Brook			400
Hubbard Brook		5,000	
Martin Brook		8,000	
Petts Brook		5,000	
Spaulding Brook		8,000	
The Branch			1,500
White Brook		8,000	
Lake Sunapee, Lake Sunapee			5,000
Lebanon, Stony Brook			300
Littleton, Ammonoosuc River		10,000	
Profile Lake			748
Rankin Brook		17,000	
Manchester, Bedford Brook		5,000	
Bowman Creek		5,000	
Corcoran Brook			400
Damon Brook		5,000	
Darrah Brook		10,000	
Dearborn Pond		5,000	

DETAILS OF DISTRIBUTION—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
New Hampshire—Continued.			
Manchester, Dumpling Brook		4,500	
Farm Brook		4,000	
Harry Brook		5,000	
Little Cohas Brook		5,000	
Nigger Brook		5,000	
Reservoir Brook			400
Schoolhouse Brook		4,000	
Sweetser Brook		5,000	
Tannery Brook		4,000	
Watts Brook		5,000	
Meredith, Bear Camp and Swift Creeks		10,000	
Merrimack, Little Chase Creek		4,500	
McQuesten Creek		5,000	
Milford, Peacock Brook		9,000	
Quoquinnipassacassenagnagnog Creek		10,000	
Tucker Brook			400
Nashua, Aloome Brook		4,000	
Great Brook			300
Hardy Brook			300
New Boston, Kidder Brook		5,000	
Newport, Cutts Brook		4,000	
Newton Brook, tributary		4,000	
Pinnacle Pond		8,000	
North Hampton, Lamprey Brook			300
Pittsfield, Turner, Chase, and Tuttle brooks			800
Portsmouth, Dearborn Brook			300
Potter Place, Hilliard Brook		5,000	
Johnson's brook		5,000	
Reeds Ferry, Babboosic Brook		5,000	
South Brookline, Rockwood's pond			300
Warner, French Brook			300
Meadow Brook			400
Wentworth, Bakers River		10,000	
West Ossipee, Whitten Pond		20,000	
Wilton, Hodgdon Brook		5,000	
Hutchinson Brook		4,000	
Miller Brook		5,000	
Souhegan River		7,000	
Stony Brook		10,000	
Winchester, Mira Brook			450
Wolfeboro, Blaisdells Brook		3,000	
New Jersey:			
Beaver Lake, Black Brook			500
Cranberry Lake, Spring Run			500
Grenloch, Big Lebanon Creek			600
Hopewell, Stony Brook			1,500
Montclair, Bradley's pond			500
South Ogdensburg, Mumson Brook			500
Sparta, Norman Brook			500
Pullis's brook			500
Sparta Creek			500
Towaco, Braeburn Lake			625
Vincentown, Bread and Cheese Run			500
Whippany, Springmeadow Brook			700
New Mexico:			
Embudo, Embudo River		12,000	
Rio Pueblo		16,000	
Santa Barbara River		16,000	
New York:			
Albany, Glen Lake			750
Apulia, Bumpus Creek		10,000	
Carr Brook		10,000	
Cold Creek			10,000
Conklin Brook		15,000	10,000
Gallinger Brook		10,000	
Gleason Brook		12,000	
Hodge Brook			10,000
Johnson Brook		10,000	
Newman Brook			10,000
Onondaga Branch		12,000	
Osborn Brook		10,000	15,000
Pleasant Hill Creek		12,000	
Vincent Brook		10,000	
Auburn, Chestnut Ridge Brook No. 1		12,000	
Chestnut Ridge Brook No. 2		12,000	
Cold Spring Brook		18,000	
North Brook		12,000	

DETAILS OF DISTRIBUTION—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
New York—Continued.			
Bedford, David Brook			375
Big Indian, Esopus Creek			1,200
Big Moose, Silver Lake		20,000	
Bliss, Wiscoy Creek		12,000	
Blossvale, Canada Creek		20,000	
Upper Fish Creek		25,000	
Boonville, Dorn Ponds		10,000	
Spring Brook		10,000	
Cambridge, Furnace Brook		12,000	375
Jackson Brook			375
Lourie Brook			250
Owlkill Creek		15,000	375
Pomanook Creek		10,000	
Cape Vincent, Carleton Ponds		12,000	
Cattaraugus, Mansfield Creek		20,000	
Cincinnatus, Otselic Creek		15,000	
Cuyler, Branch Tioughnioga Creek			12,000
Keeler Brook			12,000
Lee Brook			12,000
Dryden, Virgil Creek		20,000	
Eagle Bridge, Whipple Creek		15,000	
Frankfort, Moyer Creek		15,000	
Gabriels, Winnebago Pond			25,000
Glen Head, Littleworth Ponds			500
Greene, Genegantslet Creek		15,000	
Wheeler Brook		12,000	
Green Lake, Nine Corner Lake		30,000	
Hartford Mills, Spring Brook		12,000	
Hunter, Mitchell Hollow Creek			750
Iona Island, Queensboro Creek			1,200
Killawog, Big Brook			390
Lisle, Dudley Creek			390
Long Lake West, Belden Pond			800
Wolf Pond			700
McGraw, Trout Brook		6,000	
Marcellus, Baltimore Brook		12,000	
Ninemile Creek		20,000	
Napanock, Yama-no-uchi Pond			625
New York City, New York Aquarium	20,000		
Forest, Fish and Game Society, exhibition	5,000		
Northville, Branch Sackendaga River		20,000	
Oneonta, Otsdawa Creek		20,000	
Otter Lake, Purgatory Creek		10,000	
Owego, Owego Creek		30,000	
Patterson, Quaker Brook			750
Tobar Brook			750
Pine Hill, Esopus Creek			2,400
Pleasant Lake, Pleasant Lake		30,000	
Richmondville, Carylville Creek		12,000	
Rome, Point Rock Creek		20,000	
Sag Harbor, Noyac Beach Pond			500
Salamanca, Cornell Pond		8,000	
Saranac Lake, Pine Pond			25,000
Sherburne, Handsome Brook		12,000	
Smiths Basin, Hartford Creek			375
Wantagh, Dunn Lake			875
Watertown, Jacobs Creek		15,000	
Waterville, Oriskany Creek		20,000	
Whitneys Point, Nanticoke Creek West		20,000	
North Carolina:			
Asheville, Bull Creek			5,000
Black Mountain, Long Branch			4,000
Sugar Fork Creek			5,000
Boonford, Elk Creek			2,000
Brevard, Williamson Creek			12,000
Franklin, Nantahala River			9,500
Hendersonville, Big Hungry Creek			900
Little Hungry Creek			900
Lake Toxaway, Indian Creek			6,000
Lake Toxaway			14,000
Whitewater River			6,000
Morganton, Cranberry Creek			6,000
Ginger Cake Creek			6,000
Little Buck Creek			6,000
Ripshin Lake			6,000
Upper Creek Lake			12,000
Morrisville, Sorrell Branch Pond			1,000

Details of Distribution—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
North Carolina—Continued.			
Penrose, Laurel Creek			6,000
Little River			8,000
Pisgah Forest, Grassy Creek			6,000
Shuford Creek			6,000
Saginaw, Linville River			7,800
Selica, Catheys Creek			8,000
Waynesville, Allens Creek			7,000
Campbells Creek			7,000
Cherry Creek			5,000
Crawford Creek			7,000
Dick's creek			7,000
East Fork Pigeon River			10,000
Jonathan Creek			10,000
Lenasso Creek			7,000
Little Eastfork Creek			8,000
Pigeon River			10,000
Pisgah Creek			7,000
Platt's creek			7,000
Raccoon Creek			7,000
Richland Creek			10,000
Shining Creek			12,000
West Fork Pigeon River			12,700
Wikles Fork Creek			7,000
Wesser, Gibsons Creek			4,000
Wesser Creek, Upper Fork			4,000
West Fork			4,000
North Dakota:			
Bottineau, Strawberry Lake		3,000	
Fullerton, Willow Lake			400
Lisbon, artesian pond			12,000
New Salem, Pebble Brook			5,000
Sims, Big Muddy Creek			600
Ohio:			
Bellefontaine, headwaters Mad River		10,000	
Macochee Creek		10,000	
Spring Branch		10,000	
Chardon, branch Chagrin River		10,000	
Mansfield, Copus Run		10,000	
Dickson's run		20,000	
Rocky Fork Black Fork River		20,000	
Rocky Run		10,000	
Ruffner's creek		10,000	
Seymour Run		10,000	
Southfork Creek		10,000	
South Fork Honey Creek		10,000	
Springcreek Pond		5,000	
Spring Run		20,000	
Whetstone Creek		10,000	
Newark, Diamond Run		5,000	
Ravenna, Spring Creek			2,500
South Park, Mapleview Pond		5,000	
Wickliff, Spring Lake			2,000
Oregon:			
Ashland, Ashland Creek		1,500	
Baker City, Pine Creek Lake		5,000	
Sturgill Creek		5,000	
Bingham Springs, Yumatilla River		8,000	
Boring, Looking Glass Lake		2,000	
Columbia Beach, Pierce Creek		6,000	
Duncan, Meacham Creek		6,000	
Forest Grove, Gales Creek		8,000	
Haines, Dutch Flat Creek		8,000	
Rock Creek		4,000	
East Fork		4,000	
South Fork		5,000	
West Fork		4,000	
Rock Creek Lake		1,000	
Willow Creek Lake		1,000	
Hilgard, Beaver Creek		12,000	
Gordon Creek		10,000	
Grande Ronde River, upper		12,000	
Jacksonville, Big Squaw Lake		4,000	
Little Squaw Lake		4,000	
La Grande, Jordan Creek		3,000	
Rock Creek		2,996	
Willow Creek		2,994	
Lyons, North Santiam River		10,000	

DETAILS OF DISTRIBUTION—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Oregon—Continued.			
Milwaukee, Crystal Lake		4,000	
Mosier, Mosier Creek		4,980	
North Powder, Crawfish Lake		10,000	
Oregon City, Abernethy Creek		30,000	
Busch's pond			430
Clackamas River		10,000	
Molalla River		18,000	
Milk Creek		18,000	
Pendleton, Birch Creek		6,000	
McKay Creek		6,000	
Salem, Mill Creek		10,000	
The Dalles, Upper Eightmile Creek		8,000	
West Scio, Thomas Creek		4,000	
Pennsylvania:			
Ackermanville, Goodyear's brook			500
Greenwalt Creek			500
Altoona, Homers Gap Run			1,167
Kettle Run			1,166
Riggles Gap Run			1,167
Ansonia, Marsh Creek			1,500
Pine Creek			2,000
Austin, Moores Run			1,000
South Wood Creek			1,000
Bear Creek, Lehigh River			1,300
Bedford, Davidson's run			700
Shovers Run			800
Springmeadow Run			500
Beech Creek, Baldeagle Creek			1,500
Beech Creek			1,500
Branch Big Run			800
East Branch Big Pond			1,000
Furnace Run			600
Mill Run			700
Monument Run			800
Muddy Run			700
North Fork Tanguaschtac Creek			800
South Fork Scootac Creek			800
Spring Lick Run			700
Twin Run			700
Bellwood, Bells Run			3,000
Benton, Coles Creek			2,500
Dildines Run			500
Hog Run			500
Hulme Run			500
Lewis Run			500
Long Run			500
Loppys Run			500
Mill Run			500
Rough Run			500
Thomas Run			500
Welliver Run			500
West Creek			500
Bridgeton, Hysons Run			500
Wises Run			500
Brownton, Branch Muddy Creek			500
Otter Creek			1,000
Pine Run			1,200
Bruin, North Branch Bear Creek			500
Rapid Run			500
Bushkill, Little Bushkill Creek			2,900
Sand Creek			1,000
Cammal, Mill Run			700
Carlisle, Bucher's springs			1,000
Lutz's run			500
McCormics Run			750
Old Perry Furnace Run			750
Spruce Run			500
Central, Bear Run			500
Hog Run			500
Long Run			500
Painter Run			500
Rough Run			1,000
West Branch Fishing Creek			1,500
Chambersburg, Birch Run			2,000
Carbaugh Run			1,000
Hoosic River			1,000

DETAILS OF DISTRIBUTION—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Cherry Run, Cherry Run			1,400
Clark Summit, Kennedy Creek			700
Clearfield, Longs Run			500
Clifton, Pond Creek			700
Coburn, Domers Deich Run			500
East Elk Creek			700
Elk Creek			800
Hunters Run			700
Phillips Creek			700
Rough Run			500
Spring Bank Run			500
Turpentine Creek			700
West Elk Creek			700
Cogan Station, Cooks Run			800
Cold Spring, Smiths Run			1,000
Coles Creek, Coles Creek			1,000
Connellsville, Big Back Creek			500
Buck Run			1,000
Little Back Creek			500
Neals Run			1,000
Poplar Run			500
Roshes Run			1,000
Stony Run			500
Delta, Bunker Hill Branch			500
Cooper Branch			600
Fishing Creek			600
James Branch			500
Kalbs Branch			500
McLaughlins Branch			500
Trout Run			1,000
Woodards Run			500
Dubois, Bear Run			500
Big Anderson Creek			1,000
Little Anderson Creek			500
Montgomery Run			1,500
Narrows Creek			1,000
Sandy Creek			500
Stony Run			1,000
Wolf Run			500
Wren Run			500
Dushore, Birch Creek			800
Lick Creek			800
Little Loyal Sock Creek			2,500
Marsh Run			500
North Branch Mehoopany Creek			1,500
Panic Run			500
Pigeon Creek			500
Rock Run			500
Rusty Run			500
Stony Brook			1,000
East Liberty, Barnsdall Lake			2,000
East Stroudsburg, Deusenberry Run			1,500
Marshalls Creek			1,000
Pencil Creek			1,200
Spragle Creek			500
Wigwam Run			500
Ebensburg, Abrams Creek			500
Blacklick Creek			1,000
Clear Creek			500
Davis Creek			500
Griffith Creek			1,000
McBride Run			500
Powell Creek			500
Roaring Run			500
Roberts Run			500
Spring Creek			500
Stewart Run			500
Swift Run			500
Farrandsville, Lick Run			1,500
Queens Run			800
Tangus Scootac Creek			1,200
Felton, Barshinger Creek			1,200
Furnace Creek			600
Groves Mill Branch			600
Loras Creek			1,000
Muddy Creek			600

Details of Distribution—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Felton, North Branch Muddy Creek			1,200
Pattersons Branch			600
Pine Run			800
Purgatory Run			1,200
Rambos Mill Run			800
Rineley Branch			800
Schaw Branch			800
Wintertime Run			600
First Fork, Logues Run			500
Logues Lower Run			500
Logues Middle Run			500
Logues Upper Run			500
Norcross Run			500
Forks, Fishing Creek			1,500
Franklin, Silver Creek			500
Frazer, Quarry Pond			500
Fuller, Camp Run			500
Glencoe, Brush Creek			1,000
Haleeka, Coldfork Run			500
Doughertys Run			500
lower			500
upper			500
Long Branch			500
Wolf Run			1,000
Halls, Grand Eddy Run			500
Little Bear Creek			800
Pine Run			500
Red Ridge Run			800
Sandspring Run			800
Shingle Run			500
Hallstead, Coldspring Brook			1,000
Harmony Creek			1,000
Wiley Creek			1,000
Hollidaysburg, Canon Creek			1,000
Cave Track Creek			500
Honesdale, Big Brook			800
Calkins Creek			600
Lackawaxen Creek			1,000
Boots Creek			600
Hopewell, Fords Loop Run			500
Otts Run			500
Yellow Creek			1,000
Houtzdale, Brushy Run			500
Mountain Branch			1,000
Pine Run			500
Twin Root Creek			1,000
Wilson Pond			500
Howard, Lick Run			600
Hulls, Eastfork Creek branch			1,000
Shingle Bolt Creek			500
Stonelick Run			1,000
Huntingdon, Standing Stone Creek			3,000
Jamison City, Beach Creek			1,000
Blackberry Run			1,000
Bloody Run			500
East Fishing Creek			1,500
Elk Run			1,000
Gallis Run			1,000
Long Run			1,000
Maple Run			500
Meekes Run			500
Four Run			500
Painter Run			500
Quirn Branch			500
Rock Run			500
Rough Run			500
Spring Creek			1,000
Spruce Run			500
Sullivan Branch			500
Trout Run			500
Johnstown, Breastwork Run			1,000
Keller Run			500
Laurel Run			1,000
Laporte, Glass Creek			800
Cold Bridge Run			500
Rainbow Lake			500
Schannersburg Creek			800

DETAILS OF DISTRIBUTION—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Laurel, Collins Branch			500
Lebanon, Bachmans Creek			500
Walnut Run			500
Lewisburg, Running Gap Creek			950
Spruce Run			950
White Deer Creek			950
Lock Haven, Big Laurel Run			1,200
Big Plum Run			800
Blyler Run			500
Cedar Run			500
Chathams Run			1,000
Cherry Run			700
Craigs Fork Lick Run			500
Cramer Run			500
Deer Lick Run			700
Eagle Run			1,000
Eckerts Run			800
Elk Run			800
Falls Run			700
Fishing Creek			1,500
Fox Hollow Run			700
Hanns Run			700
Hennessey Run			500
Jerry Run			1,000
Lick Run			1,500
Little Chathams Run			700
Little Laurel Run			800
Little Plum Run			600
McElhattan Run			1,200
Moss Run			1,000
Nangle Run			700
Plum Run			1,200
Queens Run			1,600
East Branch			1,200
West Branch			700
Rams Run			700
Rapid Creek			800
Rattlesnake Run			1,000
Reeds Run			700
Rock Run			800
Scootac Run			1,200
Shades Run			700
Slippery Run			800
Spring Run			1,200
Stevens Run			1,200
Stony Run			700
Welchs Run			700
Wolf Run			1,200
Lushbaugh, Brooks Run			500
Lorshbaugh Run			1,000
Mooley Run			500
McConnellstown, Crooked Creek			1,500
Manheim, Shearns Run			600
Stony Run			800
Marietta, Cassel Run			500
Dugan Run			500
Mussers Run			500
Strickler's run			500
Trout Run			500
Waller's run			600
Wildcat Falls Creek			500
Masten, Pleasant Creek			1,000
Milford, Raymondkill Creek			800
Milroy, Coxes Valley Creek			1,500
Lingle Brook			1,000
Mount Joy, Willow Glen Spring			500
Muddy Creek, Greenbrier Branch			800
New Freedom, Bortner Branch			500
Deer Creek, Main Branch			1,500
Giesey Branch			500
Hendrix Branch			600
Mount Airy Branch			1,200
Shaffer Branch Codorus Creek			500
New Park, Big Branch			800
Glens Creek			600
Lows Creek			500
Matthews Run			600

Details of Distribution—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Oak Hall, Cedar Creek			700
Galbraiths Gap Run			600
Hassans Gap Run			500
McFarlands Run			500
Sandspring Run			500
Patton, Annas Run			500
Baughman's run			500
Buck's run			500
Cassidy's run			500
Chest Springs Run			500
Durbin's run			500
Eckenrodes Run			500
Hertsog's run			500
Laurel Run			500
Litzingers Run			500
Mulligan's run			500
Noels Run			500
North Kill Buck Creek			500
North Whetmore Run			500
Rock Run			500
Rogue Harbor Run			1,000
Ryans Run			500
St. Lawrence Run			500
Sheehan's run			500
South Kill Buck Creek			500
South Whetmore Run			500
Strittmatters Run			500
Swopes Run			500
Wire Rock Run			500
Penfield, Wilson Creek			500
Wilson Run, North Branch			500
Phillipsburg, Beaver Run			1,000
Benner Run			1,000
Big Spring Run			500
Bilger Run			500
Black Bear Run			1,500
Black Moshannon River			1,500
Buttler Run			500
California Run			1,000
Clover Run			500
Cold Creek			2,600
Fourmile Run			1,500
Little Cold Stream			1,000
McCords Run			500
Onemile Run			500
Seven Springs Run			500
Shields Run			1,000
Sixmile Run			2,000
Smay's run			1,000
Tomtit Creek			500
Twiggs Run			500
Vooge Run			1,000
Whetstone Run			500
Punxsutawney, Cissney Run			500
Hess Run			500
Little Sandy Creek			500
McCartney's creek			500
Peace Run			500
Rowan's run			1,000
Spring Creek			500
Ralston, Grays Run			1,300
Long Run			500
Rock Run			1,500
Short Run			500
Yaxhanna Run			500
Yoder Run			500
Reading, Cacoosing Creek			1,200
West Branch			1,000
Kalbach's creek			800
Limekiln Brook			500
Maiden Creek, branch			500
Moselam Creek			600
Plum Creek			1,200
Stamm's creek			800
Retort, Cold Stream			1,000
Gearhart Run			1,000
Trout Run			500

Details of Distribution—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Roaring Branch, Baldwin Branch			500
Elk Run			500
Lick Run			500
Lycoming Creek			1,500
Mayes Branch			500
Mill Creek			500
Moyer Branch			500
Roaring Branch Creek			1,000
Sugar Works Run			500
Taber Branch			500
Watkins Branch			500
Winslow's springs			500
Roulette, Card Creek			500
Fishing Creek			500
branch			500
East Branch			500
Reed Run			500
Trout Brook			500
Sheffers Station, Keeneys Run			600
Sheffers Run			700
Sheridan, Millbach Spring			600
Smithfield, Brownfield Creek			1,000
Dragoo Creek			500
Teapot Creek			500
Victor Run			1,000
Snowshoe, Beech Creek			1,500
Buck Creek			1,500
Sandy Creek			1,000
Somerset, Blue Hole Run			1,000
Springvale, Burrans Creek			1,000
Muddy Creek			800
Sinking Springs Branch			1,200
Stewartstown, Anderson Creek			700
Reibs Creek			700
Manifolds Creek			700
Stillwater, Fishing Creek			1,500
Susquehanna, Brushville Creek			600
Canawacta Creek			600
Cascade Valley Creek			600
Coldspring Brook			600
Drinker Creek			600
Egypt Creek			1,400
East Branch			600
West Branch			600
Hemlock Creek, East Branch			600
West Branch			600
Roaring Brook			1,200
Tunckhannock Creek			1,500
Wildcat Creek			600
Tipton, Tipton Run			2,000
Towanda, Big Schrader Creek			1,500
Lake Wesauking			1,000
Little Schrader Creek			500
Millstone Creek			800
Sugar Run			800
Trout Run, Fourmile Run			500
Trout Run			800
Wolf Run			800
Troy, Brandy Run			500
Bullard Run			800
Covert Creek			500
Dry Run			500
Falls Creek			500
Fellows Creek			800
Griffin Creek			800
Kiffs Run			1,000
Morgan Creek			500
Tioga River			1,000
Webler Creek			500
Tyrone, Hunters Run			666
Little Pine Run			667
Sterling Run			667
Waynesboro, Antietam Creek			1,500
Weikert, Weikert Run			2,000
West Chester, Ridley Creek			1,500
Williamsburg, Brush Run			500
McAlister's run			1,000

DETAILS OF DISTRIBUTION—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Williamsburg, Piney Creek			2,900
Roller Creek			700
Spring Run			700
Swan Hollow Creek			700
Williamsport, Bertons Branch			500
Hagermans Run			800
Jones Branch			500
Kettle Run			500
Mosquito Creek			1,000
Williamstown, Salmon River			1,500
Woodbine, Betsy Day Run			600
Boyds Run			800
Canaan Run			600
Fishing Creek			800
Galbreath's branch			1,100
Ilgenfritz Branch			500
Johns Creek			800
Kilgore Run			500
Neils Run			800
Orsons Run			800
Ramsey's run			500
Rocky Run			800
Spout Falls Creek			500
Thompson's run			800
Wade Hill Run			500
Watson Branch			500
Woe, Devils Hole Creek			800
York, Dietz Creek			800
Fryers Mill Branch			600
Kings Mill Run			800
Left Branch Poor Horse Creek			600
Lightners Run			600
Oermann's pond			600
Poor Horse Creek			800
Shady Dell Run			500
Shunks Hollow Run			600
York County, Bayberry Creek			2,700
South Dakota:			
Deadwood, Polo Creek			10,000
Shannon's pond			8,000
Two-bit Creek, headwaters			10,000
Elmore, Little Spearfish Creek			20,000
Porcupine Creek			8,000
Gary, Lac Qui Parle Creek			1,000
Hill City, Newtons Park Branch			7,500
Palmer Creek			7,500
Slate Creek			15,000
Spring Creek, headwaters			150
Imlay, Lake Paradise			5,250
Kimball, Small Lake			570
Oreville, White Horse Creek			150
Piedmont, Elk Creek			13,000
Little Elk Creek			6,500
Pine Ridge, Wounded Knee Creek			12,600
Pluma, Elk Creek			300
branch			300
lower			300
North Boxelder Creek			300
Pringle, Beaver Creek			10,000
Cold Springs			10,000
Rapid City, Chadron Creek			5,250
Rapid Creek			15,000
Spring Creek Pond			4,000
Rochford, Clear Lake			8,000
Gimlet Creek			10,000
North Fork Little Rapid Creek			30,000
Silver Creek			12,000
West Fork Rapid Creek			20,000
Savoy, Squaw Creek			10,000
Spearfish, Chicken Creek			300
Crystal Lake			5,000
McGoffin's pond			300
Murray's spring brook			600
Spearfish Creek			130,000
Sunderland's pond			4,000
Tilford, Big Elk Creek			20,000
Whitewood, Niva's pond			4,000

Details of Distribution—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Tennessee:			
Fishery, North Indian Creek			9,500
Orlinda, Summer's branch			10,000
Pikeville, Cain Creek			10,000
Roan Mountain, Heaton Creek			3,000
Utah:			
Logan, Cache Spring ponds			2,000
Koller's spring pond			2,000
Spring Creek			2,000
Spring Creek Pond			2,000
Ogden, Crystal Springs			4,000
Halls Pond			2,000
Jensen's ponds			4,000
Little Spring Creek			2,000
Ritter Creek			4,000
Spring Creek			2,000
Spring Creek Pond			2,000
Spring Pond			2,000
Wangsgard Springs			2,000
Salt Lake City, Lund's ponds			2,000
Oniqua Springs Creek			2,000
Woods Cross, Coltrin's pond			2,000
Mitchell's springs			2,000
Muir's pond			2,000
Vermont:			
Arlington, Batten Kill River			3,000
Cole Brook			2,000
Deming Brook			800
Peters Branch		36,800	
Roaring Branch			5,000
Warm Brook			6,500
Barton, Hartwell Pond			1,000
May Pond			3,000
Bellows Falls, Athens Brook			2,000
Miller Brook			2,000
Morse and Keefe brooks			1,000
Morse Brook		10,000	
Williams River, tributary			3,000
Bennington County, Casino Pond			3,000
Bennington, Paran Creek			2,500
Brattleboro, Barber's brook			1,000
Coan Brook			1,000
Holliday Brook			2,000
Stickney Brook			1,000
Whetstone Brook		15,000	
Wilder Brook		15,000	
Burlington, Reservation Pond		10,000	
Chester, South Branch Williams River		25,000	
Cuttingsville, Shrewsbury Pond		25,000	
East Fairfield, Tupper Brook		15,000	
Essex County, Forest Lake			1,000
Greensboro, Caspian Lake		30,000	
Groton, Darling Pond		125,000	9,900
Hyde Park, Lowell Pond			1,000
South Long Pond		20,000	
Lanesboro, Mud Pond			1,000
Manchester, Lye Brook			2,000
Marshfield, Kenney's pond			2,000
Middlebury, Dow Brook and Pond		5,000	
Montpelier, East Roxbury Pond		24,000	
King Brook		10,000	
Minister Brook			1,000
Northfield, Dog River		24,000	
Mudgett's brook		5,000	
Norwich, Lake Mitchell		125,000	15,000
Pittsford, Furnace Brook			5,000
Plainfield, Pigeon River		20,000	
Proctor, Bates Brook			2,000
Killington Pond			2,000
Pico Pond			18,000
Proctor's pond			1,000
Sugar Hollow Creek			3,000
Proctorsville, Twentymile Creek		15,000	
Williams River		25,000	
Putney, Holden's brook			1,000
Randolph, Alder Brook			500
Ayers Brook		15,000	
tributary		8,000	

DETAILS OF DISTRIBUTION—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Vermont—Continued.			
Randolph, Bass Brook		5,000	
Bear Hill Brook		8,000	
Chandler Brook		42,000	
Eldredge Pond			1,000
Grow Brook		10,000	
Guild Brook		8,000	
Gulf Brook		12,000	
Halfway Brook		10,000	
Howard Mill Brook		12,000	
Mafeba Lake		5,000	
Meadow Brook		5,000	
Mud Pond		5,000	300
Peth Brook		12,000	
Roxbury Brook		12,000	
Snow's brook		8,000	
Readsboro, South Branch			1,500
Richmond, Alden Pond			1,000
Roxbury, Vermont Fish Commission	84,500		
Rutland, Chittenden Reservoir			3,500
Cold River			5,000
Pico Pond			4,000
Strawberry Pond			3,000
Shaftesboro, Spring Brook			500
Springfield, Whitmores Brook		5,000	
Stockbridge, Tweed River		15,000	
St. Johnsbury, Blodgett's pond		5,000	
Borough Brook			1,100
Fairbanks Pond			2,000
Frog Pond		15,000	2,000
Grouselands Pool			2,000
Jennie Pool			2,000
Lawrence Ponds			1,000
Meadow Brook		3,000	
Morrill Brook			1,200
Pope Brook			1,000
Richardson Pond		10,639	
Sleeper River, branch			1,000
Stevens Brook			1,200
Taftsville, Babcock Brook			4,000
Townshend, Blind Brook			3,000
Chaffey Brook			3,000
Vergennes, Beaver Meadow Brook		5,000	
Waterbury, Lake Mansfield			15,000
West Branch		25,000	
Wells River, Scott Brook		20,000	
Wells River		30,000	
Wells River Club Pond		10,000	1,000
West Burke, Jobs Pond		20,000	
Nigger Pond		10,950	
West Hartford, Bigbee Creek		12,000	
Hazens Pond			600
Rockland Brook		5,000	
Whipple Brook		10,000	
West Woodstock, Evergreen Brook		5,000	
Whiteriver Junction, Vermont Fish Commission			500
Wilmington, Beaver Brook		15,000	
Woodstock, Black Pond		10,000	
Branch Beaver Brook			1,000
Dean Brook		5,000	
Tucker Brook		10,000	
Virginia:			
Big Stony Junction, Big Stony Creek			9,400
Callaghan, Spring Branch			20,000
Christiansburg, Mill Creek			800
Clifton Forge, Padds Creek			500
Fairfax, Piney Branch			600
Galax, Ballards Branch			800
Gypsum, Cawood's pond			500
Harrisonburg, Little River			16,000
North River			1,500
Hunters, Snakeden Creek			2,600
Round Hill, Long Branch			900
Salem, Snyder Branch			1,000
Stokesville, North River			1,050
Troutdale, Fox Creek			1,000
Wiehle, Snakeden Creek		20,300	

Details of Distribution—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Washington:			
Acme, Nooksack River		3,000	
Arlington, Jim Creek and reservoir		10,000	
Auburn, Wooding Creek		3,000	
Bellingham, Onion Lake			1,800
Bellingham, Fish Trap Creek			800
Bellingham, Squallicum Lake			800
Bellingham, Tenmile Creek			800
Bellingham, Wiser Lake			800
Chewelah, Phillips Pond			400
Davenport, Crab Creek		8,000	
Davenport, Hawk Creek		5,000	
Deer Park, Deener Creek			500
Deer Park, Spring Creek			500
Deer Park, Trout Creek			500
Enumclaw, Beaver Creek		6,000	
Hartford, Stevens Lake		5,000	
Hot Springs, Green River		8,000	
Lamona, Crab Creek			2,500
McMurray, Lake Cavanaugh		5,000	
Newport, Bead Lake			600
Nighthawk, Palmer Lake			500
Orient, Taylor's lake			500
Pomeroy, Tucannon River		17,700	
Republic, Monroe Lakes		2,500	
Roy, Park's lake		3,000	
Roy, Pollards Creek		3,000	
Seattle, Cedar River		5,000	
Seattle, Dungeness River		2,500	
Seattle, Humphrey Creek		2,000	
Seattle, Lake Washington		2,500	
Seattle, Raging River		3,000	
Seattle, Samamish River		2,500	
Seattle, Snoqualmie River, Little Fork		4,000	
Seattle, Snoqualmie River, North Fork		5,000	
Seattle, Upper Creek		3,000	
Vancouver, Teel's pond		750	
Woodinville, Wildcat Creek Pond		1,000	
Yelm, Hart's lake		3,000	
Yelm, Spring Creek		3,000	
West Virginia:			
Belington, Hunters Fork Creek			1,200
Burner, Elk Lick Run			3,000
Burner, Harper Run			3,000
Burner, Little River			3,000
Burner, Span Oak Run			3,000
Camden on Gauley, Gauley River			27,650
Cass, North Fork Deer Creek			12,000
Clover Lick, Clover Creek			13,500
Cove Run, Sandy Creek			2,000
Davis, Blackwater River			9,250
Durbin, Greenbrier River, West Fork			1,200
Durbin, Meadow Run			15,000
Gassaway, tributary Elk River			1,000
Hardy County, Moors Run			1,000
Harman, Brushy Run			1,000
Harman, Horse Camp Run			12,500
Harman, Roaring Creek			875
Horton, Seneca Creek			14,400
Huttonsville, Elkwater Creek			1,200
Inwood, Millers Spring Run			100
Keyser, Mill Creek			8,000
Keyser, Summeys Creek			960
Keyser, Welton Run			1,500
Laneville, Red Creek and tributaries			12,750
Marlinton, Williams River			24,500
Neola, Meadow Creek			6,000
Rowlesburg, Flag Run			560
Seebert, Cranberry Creek			24,500
Sitlington, Sitlingtons Creek			12,000
Spice Run, Spice Run			3,000
Spring Creek, Brightwell Creek			465
Spring Creek, McClintic Creek			465
Terra Alta, Tupps Run			460
Terra Alta, Snowy Creek Pond			1,000
Thomas, South Fork Blackwater River			1,500
White Sulphur Springs, Howards Creek			165

DETAILS OF DISTRIBUTION—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
West Virginia—Continued.			
Wildell, Laurel Run			15,000
Winterburn, Greenbrier River			2,000
East Fork			900
Little River			300
Wisconsin:			
Arcadia, American Valley Creek			1,800
Bennings Creek			1,500
Bishop Creek			1,800
Chimney Rock Creek			1,800
French Creek			1,500
Gilman Creek			1,800
Haines Creek			1,200
Holcomb Coulee Creek			1,800
Hunters Creek			1,800
Koenig Creek			1,200
Kreid Valley Creek			1,800
Lewis Valley Creek			1,500
Long Creek			1,800
Mineral Spring Brook			1,500
Montana Creek			2,500
Riley Creek			1,800
Rocky Run			1,800
Sandy Creek			1,500
Scharlow Valley Creek			1,200
Trout Run			1,800
Augusta, Thompson Valley Creek			1,500
Travis Creek			1,800
Bangor, Holbergs Creek			1,200
Sand Creek			1,500
Birchwood, Elizabeth Creek		8,000	
Long Lake Stream		10,000	
Sucker Creek		15,000	
Trout Creek		10,000	
Wilsons Creek		5,000	
Blair, Bear Creek			1,200
Strum Creek			1,200
Tennison Creek			1,500
Vosse Coulee Creek			1,500
Bloomer, Conroy Creek			1,200
Gunn Creek			1,200
McCann's creek			1,800
Bright, Delay Creek			1,200
Stony Creek			1,200
Chippewa Falls, Duncan Creek			6,000
Colfax, Eighteenmile Creek			2,500
Otter Creek			1,500
Coxie, Owen Creek			1,200
Deer Brook, Au Claire River			1,200
Eleva, Big Creek			1,800
Trout Creek			1,200
Elroy, Tripps Creek			1,800
Galesville, Beaver Creek and tributaries			3,000
Bion Creek			1,200
Cooley's creek			1,200
Corrigan Creek			1,200
Dutch Creek			1,200
Grants Creek			1,500
Hardy Creek			1,500
Moose Creek			1,200
North Beaver Creek			1,800
Silver Creek			1,200
South Beaver Creek			3,000
Glendale, Billings Creek			3,000
Gordon, Mishe Mokwa Fishing Club	50,000		
Grand Rapids, Sevenmile Creek			4,900
Greenwood, Black Creek			1,500
Norwegian Creek			1,500
Rocky River			1,800
Independence, Ammundson Creek			1,200
Borst Valley Creek			1,800
Chimney Rock Creek			1,800
Koenig Creek			1,200
Travis Valley Creek			1,500
Wickham Valley Creek			1,200
Zimmers Creek			1,200

Details of Distribution—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Iron River, Iron River		15,000	
branch		8,000	
tributary		8,000	
Kendall, Davis Creek			1,200
Fox Creek			1,200
La Crosse, Oehler's spring			1,200
Timber Coulee Creek			3,800
Lampson, Trout Lake		8,000	
Laona, Rat River			3,000
Mauston, Brewers Creek			1,800
Menomonie, Anderson Creek			1,200
Annis Creek			1,200
Asylum Spring			1,200
Austin Creek			1,200
Ballard Creek			1,200
Big Hay Creek			1,500
Big Missouri Creek			1,800
Bolan Creek			1,800
Boland Creek			1,200
Clarks Creek			1,200
Coon Creek			1,200
Cowan Creek			1,200
Elk Creek			2,500
Gilbert Creek			2,500
Grult Creek			1,800
Hay Creek			1,400
Iron Creek			1,200
Irving Creek			1,800
Knights Creek			1,800
Little Elk Creek			1,500
Little Missouri Creek			1,500
Little Otter Creek			1,500
Louis Creek			1,200
McCarthys Creek			1,200
Mud Creek			1,800
Otter Creek			1,800
Pine Creek			1,800
Popple Creek			1,500
Price Creek, lower			1,800
Rock Creek			1,800
Rush Creek			1,200
Sand Creek			1,800
Shafer Creek			1,200
Simonson Creek			1,200
Sinking Creek			1,500
Smith Creek			1,200
South Fork Creek			1,200
Spring Creek			1,200
Stoner Creek			1,200
Thum Creek			1,500
Tiffany Creek			1,500
Torgerson Creek			1,200
Wilcox Creek			1,200
Wolfs Creek			1,200
Merrill, Pine River, branch			1,200
Prairie River			3,000
Millston, Mattchett Creek			1,200
Zarte Creek Pond			2,500
Mondovi, Big Creek			1,800
Brown Creek			1,200
Carroll Creek			1,500
Elk Creek			1,800
Ford Creek			1,500
Franz Way Creek			1,500
Rosman Creek			1,800
Manitowoc, Spring Creek			1,500
Rice Lake, Auger Creek			3,000
Barker Creek			3,600
Big Bear Creek			3,600
Big Kettle Creek			3,000
Browns Creek			3,000
Butternut Creek			3,000
Cannon Creek			3,000
Cobb Creek			3,600
Cranberry Creek			6,600
Deitz Creek			3,000

Details of Distribution—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Rice Lake, Desair Creek			3,600
Devils Creek			3,000
East Branch Creek			3,600
German Creek			3,600
Hay River			3,000
Hemlock Creek			3,000
Heyer Creek			3,600
Hickey Creek			3,600
Little Bear Creek			3,000
Little Fall Creek			3,600
Little Savage Creek			3,000
Little Spring Creek			3,000
Little Tuscobia Creek			3,600
Lost Creek			3,000
Meadow Creek			3,000
Miller Creek			3,000
Moosier Creek			3,000
Mud Creek			3,000
Olsen Creek			3,000
Overby Creek			3,000
Pekegamo Creek			6,600
Pigeon Creek			3,600
Pine Creek			3,600
Prairie Creek			3,000
Renville Creek			3,600
Rice Creek			3,000
Rock Creek			3,000
Savage Creek			3,000
Silver Creek			3,600
Sletlons Creek			3,000
South Creek			3,000
Spoon Creek			3,000
Spring Creek			3,600
Spurnine Creek			3,600
Sucker Creek			3,600
Tuscobia Creek			3,600
Weiss Creek			3,600
West Branch Creek			3,600
Yellow River			3,000
River Falls, Kinnickinnic River			2,500
Southfork Creek			1,200
Soperton, Branch Oconto River			3,000
Sparta, Big Creek			2,400
Soper Creek			2,400
Walworth Creek			2,400
Stevens Point, Springville Creek			2,100
Strum, Lyons Creek			1,200
Spring Creek			1,200
Tomah, Cold Creek			1,800
Council Creek			1,200
Deer Creek			1,500
Silver Creek			3,000
Sparta Creek			1,800
Viroqua, Johnson Creek			1,200
Rarrison Branch			1,500
Waupaca, Waupaca River			6,000
Wautoma, Soule Creek			1,200
Westby, Coon Creek, branch			1,200
North Branch			2,500
Eyster Creek			1,500
Freeming Creek			1,800
Gillette Branch			1,200
Kallock Creek			1,500
Knapp Creek			1,200
Miner Creek			1,200
Norbo Creek			1,200
Otter Creek			1,800
Rogstad Creek			1,200
Seas Branch			2,700
Sherve Creek			1,200
Bad Ax Creek, South Branch			3,000
Spring Coulee Creek			1,200
Spring Valley Creek			1,500
Timber Coulee Creek, branch			1,200
Van Ruden Creek			1,200
West Kickapoo Creek			1,200
branch			1,200
Wheeler, Blank Creek			1,200
Laforge Creek			1,200

Details of Distribution—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Whitehall, Barlow Valley Creek			1,200
Beaver Creek			1,500
Bruce Valley Creek			1,200
Crystal Creek			1,500
Elk Creek, North Branch			1,500
South Branch			1,500
Fly Creek			1,500
Hay Creek			1,500
Irvine Creek			1,200
North Valley Creek			1,200
Pigeon Creek			2,500
Wilton, Dorset Creek			1,200
Hibbard's creek			1,200
Posey Creek			1,200
Slaten Creek			1,200
Waege Creek			1,200
Withee, Missling Creek			1,200
Wyoming:			
Aladdin, Pine Creek			4,000
Basin, Cedar Creek			600
Beulah, Sand Creek			20,000
Newcastle, Stockade Beaver Creek			1,000
Sheridan, Bostwick's pond			200
Kemp Creek Pond			200
Piney Creek Pond			200
Spear's pond			200
Tepee Lake			200
Yellowstone National Park, Indian Creek			27,000
Swan Lake			9,000
Willow Creek			28,000
Argentina:			
Buenos Aires, Argentine Government	75,000		
Total [a]	1,473,400	6,307,048	3,471,292

SUNAPEE TROUT.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
New Hampshire:			
Lake Sunapee, Lake Sunapee		191,736	

GRAYLING.

Disposition.	Eggs.	Fry.
Colorado:		
Berrys Station, Eagle River		17,000
Hartsell, South Platte River		16,000
Norrie, Frying Pan River		17,000
Missouri:		
Cuba, applicant	50,000	
St. Joseph, Missouri Fish Commission	50,000	
Montana:		
Madison County, Elk Creek		997,000
Wisconsin:		
Bayfield, Wisconsin Fish Commission	50,000	
Wyoming:		
Sheridan, applicant	50,000	
Total	200,000	1,047,000

PIKE.

Disposition.	Fingerlings, yearlings, and adults.
Iowa:	
Clayton, Mississippi River	6,000
Lansing, Mississippi River	750
North McGregor, Mississippi River	6,000
Minnesota:	
Brownsville, Mississippi River	2,000
Wisconsin:	
Genoa, Mississippi River	750
La Crosse, Mississippi River	2,050
Total	17,550

[a] Lost 104,675 fry and 14,187 fingerlings.

Details of Distribution—Continued.

CRAPPIE AND STRAWBERRY BASS.

Disposition.	Fingerlings, yearlings, and adults.
Arkansas:	
Decatur, Cramblett's pond	100
Greenwood, Harper's pond	100
Lake Village, Lake Chicot	900
Malvern, Stanley's lake	200
Morrilton, Earl's pond	200
Pine Bluff, Arquilla Lake	200
Stamps, Bodcan Creek	250
Texarkana, Powell Pond	100
Delaware:	
Wilmington, Brandywine Creek	3,500
and tributary	
Du Pont's pond	200
Illinois:	
Belleville, Crystal Lake	600
Heineman's lake	400
High Prairie Lake	200
Kaiser Lake	150
Kraft's pond	200
Leopolds Lake	200
Mitchell's pond	200
Spring Lake	400
Bunker Hill, Raymond's pond	200
Carbondale, Dillinger Lake	200
Chrisman, Light Pond	200
Columbia, Gilmore Lake	450
Effingham, Kenaggee Lake	300
Hallidayboro, Kelley's lake	200
McLeansboro, Oakgrove Pond	200
Marshall, Henbest Lake	500
Mitchell, Long Lake	200
Murphysboro, Carbon Lake	500
Nashville, Carlsbad Lake	400
Savanna, Mississippi River	20,000
Springfield, Camp Lincoln Pond	200
Waterloo, Island Lake	150
Indiana:	
Attica, Hunter Pond	200
Kates Pond	100
Aurora, Cheek's pond	100
Boonville, Cypress Lake	100
Brazil, Suttie's pond	100
Brownsburg, White Lick Creek	300
Cambridge City, Bales Pond	200
Hagerstown Canal	200
Simons Creek	200
Columbia City, Tuttle Lake	100
Dublin, Simonds Creek	200
Evansville, Stringtown Pond	100
Fairmount, Bell's pond	100
Greenfield, Spring Lake	200
Laurenceburg, Double Lick Creek	200
Lexington, English Pond	100
Macy, South Mud Lake	200
Monticello, Big Creek	300
Tippecanoe River	300
North Liberty, Geyer's pond	100
Oakland City, City Waterworks Lake	150
Richardson's pond	100
Osgood, Lamb Pond	100
Princeton, Spring Grove Lake	100
Richmond, Thistletwaites Pond	200
Rushville, Gravel Lake	100
Russiaville, Little Wildcat Creek	200
Pioneer Creek	150
Pleasant Mill Pond	150
Terre Haute, South Hulman Pond	150
Vincennes, Fort Knox Lake	100
Iowa:	
Bellevue, Mississippi River	20,000
Clayton, Mississippi River	20,000
Donahue, Keppy's pond	200
Elwood, Bluff Creek	300
Fairfield, Fairfield Lake	500
Iowa—Continued.	
Lansing, Mississippi River	7,500
Manchester, Maquoketa River	5,250
North McGregor, Mississippi River	31,000
Kansas:	
Burden, Brooks' pond	100
Smith's pond	100
Cherokee, Crystal Lake	150
Columbus, Staton's pond	100
Council Grove, Neosho River	300
Coyville, Spring Lake	100
Eldorado, Walnut Creek	200
Fredonia, Yerkes Lake	100
Grenola, Caney Creek	150
Hiawatha, Brown's pond	150
Huron, Anthony's pond	150
Kimball, Silverdale Lake	125
Medicine Lodge, Warren Pond	125
Mound City, Fairbanks Spring	200
Princeton, East Pond	200
Sabetha, Keim's pond	150
Scott City, Smith's pond	100
Seward, Smith's pond	100
Sharon, Fruit Farm Spring	200
Kentucky:	
Anchorage, Clear Lake	150
Bardstown, City Reservoir	100
Berry, South Licking River	200
Bowling Green, Drakes Creek	250
Campbellsburg, Nuttall's pond	150
Covington, Mueller's pond	100
Crab Orchard, Spring Lake	300
Cropper, Spring Pond	150
Willow Pond	150
Woods Pond	150
Cynthiana, Highland's lake	100
Ammerman's pond	100
Locust Lawn Pond	100
Dawson Springs, Lake Alexandria	125
Eminence, Beach Grove Pond	150
Crabb's pond	150
Hall's pond	150
Karr's pond	150
Middleton's pond	150
Pinegrove Reservoir	150
Randall's pond	150
Warford's pond	150
Erlanger, Erlanger Fair Lake	100
Ewington, Atkinson's pond	150
Falmouth, Willow Pond	100
Frankfort, Julian's pond	150
Lakeview Pond	150
Silver Lake	150
Sullivan's pond	150
Franklin, Drakes Creek	150
Fredonia, Moss Lake	250
Wyatt Lake	150
Guthrie, Clearwater Pond	150
Hopkinsville, West Fork Little River	150
Idlewild, Bluegrass Lake	100
Jett, Boles' pond	150
Nichol's pond	150
Lexington, Eastin's pond	300
Hickman Creek	150
Silver Lake	150
Ward's pond	150
Ludlow, Lagoon Pond	100
Maysville, Lake Killarney	100
Metz, White Villa Lake	200
Midway, Farm Pond	150
Mount Sterling, Clark's pond	150
Fairs' pond	150
Stillwater Pond	150
Watson's pond	150
Paris, Daniel's pond	100
Hume Pond	100

DETAILS OF DISTRIBUTION—Continued.

CRAPPIE AND STRAWBERRY BASS—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Kentucky—Continued.	
Paris, Lyndale Farm Pond	100
Redman's pond	100
Stony Creek	200
Thompson's pond	100
Water Lily Pond	100
Wilson's ponds	300
Pinegrove, Allen's pond	150
Gay's ponds	150
Rocky Hill Station, Park Pond	150
Shelby City, McRobert's pond	350
Shelbyville, Kleinwood Pond	100
Sparta, Todds Pond	150
Versailles, Boston Pond	100
Edwards Pond	100
Glen Lake	100
Harris' ponds	200
Lewis Lake	100
Lotawana Pond	300
Newman's pond	100
Wilson Pond	100
Vine Grove, Viers' pond	150
Waverly, Wheatley's pond	150
Winchester, Club Lake	150
Elkin Pond	150
Gordon Pond	150
Haggard's pond	150
Hamilton Pond	150
Redmon Pond	150
Reed Pond	150
Reeves' pond	150
Robb Pond	150
Sphar's pond	150
Waterworks Lake	150
Winchester Reservoir	450
Witherspoon's pond	150
Louisiana:	
Alden Bridge, Love's pond	75
Grand Cane, Elm Grove Pond	200
Sample's pond	100
Shady Grove Pond	100
Hosston, Thompson's pond	100
Jeanerette, Lotus Pond	100
Lake Providence, Lake Providence	100
Longstreet, Allen's pond	100
Marthaville, Crescent Lake	200
Napoleonville, Godchaux Canal	100
Natchitoches, Scarborough's lake	75
Saline, Freestone Pond	75
Minnesota:	
Brownsville, Mississippi River	9,000
Smiley, Pelican Lake	125
St. Paul, Minnesota Fish Commission	1,500
Wheaton, Lake Traverse	300
Mississippi:	
Ackerman, Spring Branch	100
Clinton, Menger's pond	100
Rain Pond	100
Corinth, Berry's lake	100
Edwards, Chichester's pond	100
Redfind's pond	100
Kosciusko, Cain's pond	100
Lexington, Ashley's pond	100
Magee, Burnham's pond	200
Magnolia, Hurricane Creek	300
Meridian, Wanita Lake	200
Scooba, Cochrane and Harrington's pond	100
Wheelers, Tutt's lake	100
Yazoo City, Wolf Lake	100
Missouri:	
Aurora, James Fork White River	300
Columbia, experiment pond	200
Everton, Prairie View Lake	300
Fairview, Shoal Creek Pond	100
Glen Echo, Lake McCreery	200
Missouri—Continued.	
Hamilton, Shively's pond	300
Higbee, Higbee Pond	100
Horine, Barnard's lake	200
La Russell, Brunner's pond	200
Matson, Matson's reservoir	200
Medford, Medford Reservoir	200
Monett, reservoir	200
Nevada, Katy Allen Pond	600
Neosho, Hickory Creek	742
Indian Creek	200
Ruark's pond	100
Shoal Creek	200
Orchard, Frisco Orchard Lake	100
Sheldon, Bird's pond	200
Springfield, Fountain Spring	200
Ten Brook, Cedar Crest Lake	200
Crescent Lake	100
Wheaton, Hurlbut's pond	100
New Jersey:	
Wenonah, Bell's lake	1,200
New Mexico:	
Portales, Haskew's pond	100
McMinn's pond	100
Wimberly's pond	100
Roswell, Artesian Lake	100
Deep Lake	200
Johnston's pond	100
Sidello Lake	200
Wigwam Lake	100
Texico, Curry's pond	100
New York:	
Port Henry, Bass Lake	400
Hatch Ponds	400
North Dakota:	
Balfour, Cottonwood Lake	88
St. John, Forest Lake	50
Grass Lake	50
Island Lake	50
Round Lake	50
Ohio:	
Dayton, Soldiers Home Lake	200
Springfield, Mad River	200
Oklahoma:	
Ada, Cotton's pond	100
Alva, Springcreek Lake	125
Ardmore, Love's pond	200
Guthrie, Summitview Pond	100
Marietta, Twinoak Lake	200
Pauls Valley, Camp's lake	175
Kerr's lake	175
Perry, Bryan Pond	100
Stillwater, Morris' pond	100
Swartz' pond	125
Zelma, Barby's pond	125
South Dakota:	
Desmet, Lake Thompson	200
Tennessee:	
Donelson, Whitworth Pond	200
Mason, Elcan's pond	63
Herring's pond	62
Nashville, Bryans Bayou	200
Union City, Harmond's pond	125
Lakeland Pond	150
McDowell's pond	125
Texas:	
Austin, Slaughter Creek Lake	200
Cotulla, irrigation reservoir	20
Crockett, Frannon Lake	20
Parrish Lake	20
Denison, Lake Shawnee	200
Fort Worth, Idle Hour Club Lake	124
Henderson, Allen's lake	75
Brown's lake	75
Clear Lake	75
Griffin's pond	75
Little Brushy Lake	75
Stafford Lake	75
Windless Lake	75

Details of Distribution—Continued.

CRAPPIE AND STRAWBERRY BASS—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Texas—Continued.	
Italy, Bell Branch Lake	100
Jacksonville, Boles's lake	50
Elberta Lake	60
Fishing Club's lake	50
Ragsdale's lake	50
Shushon Lake	50
Jewett, Anderson's lake	50
Madisonville, Patterson Lake	60
Mart, Townsend's lake	100
Otto, Kunkle's pond	24
Louschen Lake	50
Palestine, Crystal Lake	250
Fishing Club's lake	75
Harris Lake	100
Pessoney's pond	100
Pine Lake	50
Rockdale, Wolf Hollow Pond	50
San Antonio, Fivemile Creek Pond	50
Mitchell Lake	100
San Antonto River	75
Westend Lake	100
Taylor, Henderson's dam	25
Henderson and Long Branch Pond	25
Waco, Crows Retreat Pond	30
Prather's pond	50
Silver Lake	30
Virginia:	
Ashburn, Goose Creek	200
Hay's pond	100
Beaverdam, Mill Pond	300
Carson, Fenns Pond	100
Chester, Sheild's pond	100
Danville, Deer River Lake	150
Virginia—Continued.	
Fries, New River	200
Jarratt, Baptizing Pond	100
Laurel, Bolton's pond	100
Henrico Fishing Club Pond	100
Oak Swamp Pond	150
Willow Branch Pond	200
Leesburg, Tuscarora Creek	100
Morrison, Mill Pond	150
Newsoms, Barham's pond	100
Norfolk, Lake Joyce	150
Lake Lawson	150
Lake Wright	100
Powhatan, Clement's pond	100
Richmond, Fourqurean's pond	100
Fulton Fishing Club's pond	150
West Hampton Lake	150
Ringgold, Ice Pond	100
Ruther Glen, Bunker Hill Branch Pond	100
Toano, Martin Pond	100
Winston, Winston's pond	100
Zuni, Gracy's pond	150
West Virginia:	
Parkersburg, Lily Pond	200
Sutton, Elk River	1,200
Wisconsin:	
Genoa, Mississippi River	7,500
La Crosse, Mississippi River	10,700
Prairie du Chien, Mississippi River	11,000
Total [a]	200,268

ROCK BASS.

Disposition.	Fingerlings, yearlings, and adults.
Alabama:	
Anniston, Lloyd's pond	200
Opelika, Greendale Pond	100
Talladega, Flinn Spring	300
Waverly, Jones Pond	100
Arkansas:	
Blevins, Wood's pond	100
Elliott, Smith's pond	100
Texarkana, Pitman Pond	100
Colorado:	
Littleton, Springer's pond	85
Georgia:	
Andersonville, Gwynes Pond	100
Fort Valley, Lake Clara	100
Montezuma, Pond and stream	200
Indiana:	
Batesville, Hist's pond	60
Brazil, Birchcreek Pond	60
Hill Pond	100
Carbon, Gravel Pit Pond	100
Carmel, Pogues Run pond	100
Castleton, Happy Hunting Grounds Lake	60
Cloverdale, Sipple's pond	60
Cory, Rector's pond	60
Covington, artificial lake	74
Crawfordsville, West Water Babble Pond	74
Dana, Happy Hollow Pond	60
Evansville, Brickyard Pond	100
Fridy's pond	100
Stringtown Pond	100
Indiana—Continued.	
Farmersburg, Lash's pond	60
Fort Branch, Oakdale Pond	100
Fountain City, Willowgrove Pond	60
Hobbs Station, Dellinger's pond	74
Indianapolis, Elmhurst Spring	60
Lebanon, Buchannan's pond	60
Newcastle, Hazelrigg's pond	100
New Richmond, Lee's pond	74
Princeton, Knight's pond	100
Rockport, Payne's pond	80
Russiaville, James's pond	74
Seelyville, Phillips Pond	100
Summerville, Taylor's lake	50
Terre Haute, Channel Pond	100
Kansas:	
Elbing, Henry Creek	100
Garden City, Peachgrove Pond	100
Hiawatha, Trent's pond	100
Lenora, Zohner's pond	150
Longton, Hitchen Creek	450
Oketo, Keck's pond	100
Peabody, Henry Creek	250
Gleits, Long Lake	125
Spring Lake	100
Kentucky:	
Allensville, Clear Pond	100
Mimms Pond	150
Riley Pond	100
Ashland, Gaylord Pond	150
Auburn, Blacklick Creek	150

[a] Lost in transit, 1,777.

DETAILS OF DISTRIBUTION—Continued.

ROCK BASS—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Kentucky—Continued.	
Austerlitz, Thompson's pond	150
Bardstown, Crystal Spring	650
Stoner's lake	650
Cadiz, Little River	425
Muddyfork Creek	325
Dickson, Stone's pond	100
Dry Ridge, Hightower's pond	100
Eminence, Brewer's pond	100
Drane's pond	100
Jackson's pond	100
Rowland's pond	100
Sandford's pond	125
Sweeny's pond	125
Erlanger, Beeches South Pond	100
Gaines's pond	100
Sullivan's pond	100
Flournoy, Harris's pond	175
Franklin, Atkerson's pond	100
Robey's pond	150
Fredonia, Rice Pond	475
Glencoe, Sunset Lake	100
Guthrie, Allen's pond	150
Hodgenville, Kirkpatrick's pond	100
Horse Cave, Hodges Pond	200
Hutchison, Willett's pond	100
Johnson Junction, Summit Lake	150
La Grange, Highland Lake	275
Lexington, Gorham's pond	125
Limestone Pond	100
Shandon Pond	150
Paint Lick, Fish's pond	150
Paris, Oakgrove Pond	150
Peaks Station, Peak's pond	100
Pembroke, Fulcher's pond	100
Pendleton, McDonald's pond	100
Pleasureville, Fall's pond	100
Shelbyville, Carey's pond	100
Dales Pond	200
Pyles Pond	100
Trenton, Mimm's pond	100
Versailles, Hampton's pond	100
Visalia, Lamb's pond	100
Walton, Conrad's pond	100
Winchester, Wheeler Lake	1,400
Louisiana:	
Coushatta, Mobly Pond	100
Gibsland, Key's pond	100
Rosepine, Flat Creek	100
Maryland:	
Frederick, Spring Pond	100
Lochs Raven, Harrison's pond	100
Monkton, Miller's pond	100
Missouri:	
Columbia, experimental pond	25
Glasgow, Steinmetz Pond	150
Marshall, Hopkins's pond	100
New Mexico:	
Capitan, Titworth's pond	150
New York:	
Brewerton, North Fork Oneida River	100
New Berlin. Umadilla River	100
New Paltz, Squirrel Eye Brook	170
North Carolina:	
Nashville, Whitley's pond	150
Stony Point, Thirdcreek Pond	100
Taylorsville, Adams Pond	100
North Dakota:	
Hebron, Jeager's pond	100
Oaks, Olthoff's pond	150
Ohio:	
Cumminsville, Rosenfeld's pond	60
Jamestown, Spahr's pond	60
Oklahoma:	
Edmond, Reed's pond	100
Milburn, Horn's lake	100
Oklahoma—Continued.	
Paola, Willow Pond	100
Pauls Valley, Horse Shoe Lake	150
South Dakota:	
Fairburn, Mills Pond	100
Highmore, Artesian Pond	125
Kimball, Eaglecreek Pond	200
Murdo, Taggert's pond	200
Orient, Park Pond	100
Pierre, Hausman's pond	200
Presho, Christianson's pond	300
Tennessee:	
Athens, Eastanaula Creek	125
Jefferson City, Barn Pond	200
Lewisburg, Powell's pond	100
Lewisville, French's pond	100
Maryville, Taylor's pond	100
Springwater Lake	100
Niota, Wallis' pond	100
Pikeville, Farmer's pond	100
Texas:	
Artesia, Allee's pond	50
Bryan, Fin and Feather Club lake	120
Converse, Meurin's pond	75
Cumby, Oil Mill Pond	75
Dallas, Wah Hoo Club Lake	200
Dennison, Blackford's pond	50
Fort Worth, Idle Hour Club lake	39
Franklin, Hathaway's pond	17
Giddings, Neitsch's pond	75
Gonzales, Maurin Lake	50
Gunter Switch, Dumas Pond	50
Hoard's lake	75
Henderson, Watkins Pond	75
Irene, Myrick's lake	20
Reed Lake	25
Jacksonville, Irwin Lake	25
Lometa, Hal Springs Pond	50
Longview, Elliott's pond	24
Lovelady, Morrow Lake	50
Marquez, Henson's pond	20
Milano, McClelland's pond	30
Otto, Green Lake	50
Overton, Brown Lake	85
Palestine, Crystal Lake	40
Pittsburg, Boyd's pond	100
San Angelo, Lake Concho	50
San Marcos, Dreibrodt's pond	50
Santa Anna, Mukewater Lake	50
Rendleman's pond	50
Shield Park Pond	50
Willow Pond	50
Sherman, Harvey's pond	50
Jennings Pond	75
Sulphur Springs, Davis' pond	50
Hurley Pond	50
Mitchell's pond	180
Perkins Pond	50
Sweetgum Branch	50
Troupe, Shaw's pond	75
Waxahachie, Katy Lake	380
Marchbank's pond	60
Wills Point, West's pond	75
Winnsboro, Patrick's pond	100
Virginia:	
Abingdon, Roberts Pond	100
Barbersville, Mountainview Lake	100
Betty Baker, Steeles Branch Pond	100
Buffalo Junction, Shelton's pond	150
Gordonsville, Lambert's pond	250

DETAILS OF DISTRIBUTION—Continued.

ROCK BASS—Continued.

Disposition.	Fingerlings, yearlings, and adults.	Disposition.	Fingerlings, yearlings, and adults.
Virginia—Continued.		Virginia—Continued.	
Patton, Baber's pond	100	Roanoke, Back Creek	500
Howardsville, Algoma Woods Pond	100	Roxbury, Crystal Pond	100
Laurel, Bowers' pond	125	Tunstall, Garlicks Mill Pond	150
Mill Pond	125	West Virginia:	
Luray, Brumback's pond	200	Hawks Nest, Goins Pond	200
Norwood, Norwood Pond	100	Wisconsin:	
Raphine, Hay's creek	200	La Crosse, Mississippi River	100
Richmond, Bloody Run Pool	100	Total [a]	25,090
Ringgold, Woods Lake	200		

WARMOUTH BASS.

Alabama:		Texas—Continued.	
Estelle, Lambert's pond	200	Irene, Reed's lake	25
Sharp's pond	100	Jacksonville, Irwin Lake	25
Fayette, Bankhead's pond	500	Madisonville, Allen Mill Pond	50
Louisville, Hagler's pond	200	Marguerite Park Pond	25
Georgia:		Marquez, Henson's pond	10
Tifton, Sego Pond	130	Mart, Simmons Pond	30
Texas:		Maypearl, Wynn's pond	30
Bedias, McDonalds Pond	25	Otto, Hornell's pond	30
Calvert, Bushes Pond	24	Palestine, Crystal Lake	40
Dennison, Blackford's pond	50	Waco, Quincy's pond	30
Devine, Burton's reservoir	50	Total	1,638
Franklin, Hathaway's pond	35		
Fort Worth, Idle Hour Club's lake	29		

SMALL-MOUTH BLACK BASS.

Disposition.	Fry.	Fingerlings, yearlings, and adults.	Disposition.	Fry.	Fingerlings, yearlings, and adults.
Arkansas:			Indiana—Continued.		
Des Arc, Calotchie Bay	10,000		Battle Ground, Smith's pond		1,125
England, Clear Lake	15,000		Broomfield, Clifty Creek		450
Mammoth Spring, English Creek		1,000	Plummer Creek		450
Myatt River		800	Richland Creek		700
Spring River		1,700	White River		450
Warm Fork Spring River	10,000		Boonville, Cypress Creek		261
Connecticut:			Pigeon Creek		262
Norwich, Gardiner Lake	2,000		Brookston, Tippecanoe River		1,125
Oxoboxo Pond	250		Carthage, Big Blue River		675
Illinois:			Columbia City, Goose Lake		500
Belvedere, Kishwaukee River		325	Elkhart, St. Joseph River		500
Bloomington, Heafers Lake		250	Hobart, Lake George		300
Edwardsville, Banner Clay Lake		675	Indianapolis, Eagle Lake		220
Round Lake, Round Lake		300	Fall Creek		440
Indiana:			White River		220
Anderson, White River		675	Kimmell, Johnson Lake		250
Angola, Fish Creek		500	Manier Lake		250
Howard Lake		500	Metz's pond		250
Lake James		500	Smalley Lake		250
Snow Lake		500	Lapel, Wright Gravel Pond		675
			Leesburg, Tippecanoe Lake		375
			Ligonier, Diamond Lake		505
			Lima, Pigeon River		500
			Macy, North Mud Lake		1,000
			New Albany, Knob Crest Pool		750
			Noblesville, White River		370
			Peru, Eel River		1,000

[a] Lost, 3,505 fingerlings.

Details of Distribution—Continued.

SMALL-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Indiana—Continued.		
Plymouth, Pretty Lake		500
Shelbyville, Big Blue River		350
Little Blue River		375
Vincennes, Roberson's lake		262
Wawassee, Lake Wawassee		750
Williamsport, Big Pine Creek		250
Shawnee Creek		300
Wabash River		250
Iowa:		
New Hampton, Little Cedar River	2,000	
Kentucky:		
Bardstown, Johnson's pond	4,000	
Cadiz, Little River		300
Sinking Fork Creek		300
Guthrie, Elk Ford Red River		750
Lancaster, Lake Placid	4,000	
Mount Sterling, Slate Creek	4,000	
Pineville, Straight Creek	4,000	
Somerset, Fishing Creek	4,000	
Springfield, Lewis Lake	4,000	
Stanford, Dix River	4,000	
Wasioto, Clear Creek	4,000	
Cumberland River	4,000	
Pucketts Creek	4,000	
Winchester, Wheeler Lake		400
Woodburn, Drake Creek		400
Maine:		
Holden, Holbrook's pond	10,000	
Maryland:		
Rockville, Patuxent River	4,000	
Silver Springs, Branch Anacostia River	4,000	
Massachusetts:		
Falmouth, Jenkins Lake	1,500	
Mare's pond	1,500	
Gloucester, Cape Pond	1,500	
Medfield, Mine Brook Pond	1,500	
North Easton, Stonehouse Hill Pond	1,500	
North Woburn, Maple Meadow Lake	1,500	
Princeton, Asne Con Comic Lake	1,500	
Waltham, Charles River	1,500	
Webster, Lake Chanbunagungamaug	2,000	
Woods Hole, Long Pond	2,000	
Old Home Pond	1,500	
Michigan:		
Albion, Prairie Lake		250
Bancroft, Howheiser Lake		250
Beulah, Round and Little Platte lakes		200
Brighton, Ore Lake		500
Chelsea, Crooked Lake		250
Mud Lake		300
Clarks Lake, Clarks Lake		250
Clarkston, Parkinson Lake		200
Coldwater, South Lake		300
Corunna, Shiawassee River		250
Edwardsburg, Eagle Lake		500
Empire, Glen Lake		300
Gladwin, Pratt's lake		500
Greenville, Flat River		2,000
Wabasis Creek		1,000
Gregory, Morgan Lake		175
Hanover, Farewell Lake		250
Round Lake		250
Hillsdale, Baw Beese Lake		800
Howell, Kneeland Lake		1,000
Long Lake		1,000
Pardee Lake		150
Michigan—Continued.		
Ironwood, Triplett Lake		150
Jackson, Clarks Lake		300
Clear Lake		300
Wolf Lake		300
Jonesville, Upper Mill Pond		300
Lake Gogebic, Lake Gogebic		125
Ludington, Hamlin Lake		1,000
Maltby, Au Sable Lake		500
Manitou Beach, Devils Lake		500
Manistee, Canfield Lake		250
Minden City, Czapp's pond		100
Montague, Big Blue Lake		1,000
Negaunee, Walton's lake		250
Newaygo, Emerald Lake		250
Hess Lake		300
Northville, Union Lake	1,000	
Walled Lake	1,000	
Omer, Duck Lake		500
Elliott Lake		500
Orion, Lowery Lake		500
Oxford, Davis Lake		1,000
Narrin Lake		300
Stony Lake		1,000
String of Lakes		1,000
Pentwater, Pentwater Lake		1,000
Perry, Wimple Lakes		500
Pontiac, Cass Lake		500
Threemile Lake		500
Rose Center, Bennet Lake		1,000
North Buckhorn Lake		1,000
Round Lake		1,000
St. James, Barney's lake		500
Saline, Arnold's lake		250
Sidnaw, Crystal Lake		150
Kunze Lake		150
Springport, Cockroft's lake		250
Standish, Rifle River		250
Walled Lake, Lower Straits Lake		300
Watersmeet, Crooked Lake		125
White Pigeon, Marl Lake		375
Minnesota:		
Brookston, Stony Brook		150
Duluth, Bear Trap River		150
Otter Lake		150
Rochester, Cascade Creek		100
Lake Shady		100
South Branch Zumbro River		100
St. Paul, Minnesota Fish Commission		3,100
Mississippi:		
Aberdeen, Cypress Lake		750
Dead River Lake		1,250
Horse Shoe Lake		750
Sims Lake		750
Missouri:		
Crane, Railroad Pond		1,900
New Hampshire:		
Pittsfield, Jenness Lake	2,000	
Sunapee, Lodge Pond	382	365
New Jersey:		
Sussex County, Lake Grinnell	4,000	
White Lake	4,000	
New York:		
Auburn, Owasco Lake		250
Morrisville, Hatche's lake		175
Sharon Springs, Argusville Pond		175
North Carolina:		
Hope Mills, Little Rockfish Creek Lake		10

Details of Distribution—Continued.

SMALL-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Ohio:		
Antwerp, Maumee River		500
Cambridge, Taylor Pond		450
Dayton, Channel Lake		250
Defiance, Maumee River		500
Newark, Raccoon Creek		500
Otway, Brush Creek		350
Pleasant Hill, Stillwater River		500
Ravenna, Mahoning Creek		500
Wapakoneta, Auglaize River		500
Youngstown, Lake Glazier		500
Pennsylvania:		
Confluence, Youghiogheny River		300
Doylestown, Neshaminy Creek	4,000	
Swamp Creek	4,000	
Pohickon Creek	4,000	
Freemansburg, Lehigh River	4,000	
New Salem, Reservoir No. 2		300
Norristown, Plymouth Creek	3,000	
Stewarton, Youghiogheny River		300
West Chester, Brandywine Creek		375
Tennessee:		
Ashland City, Sycamore Creek		750
Chattanooga, Chickamauga Creek		100
Chickamauga Lake		100
North Chickamauga Creek		100
Elizabethton, Doe River		450
Watauga River		450
Lenoir City, Pow Pow Creek		100
Sadlers, Elk Ford Red River		750
Springfield, Red River		400
Summertown, Little Buffalo Creek		750
Tennessee—Continued.		
Tenga, Sylco Creek		550
Vermont:		
Castleton, Lake Bomoseen	11,500	
Marshfield, Nob Hill Pond	11,500	
West Danville, Joes pond	16,480	
Virginia:		
Belmont Park, Goose Creek	16,000	
Fredericksburg, Rappahannock River	3,500	
Providence Forge, Mirror Lake	3,500	
Rapidan, Rapidan River		300
Saltville, North Fork Holston River	500	
Washington:		
Liberty Lake, Liberty Lake		250
Medical Lake, Clear Lake		500
Moab, New Man Lake		250
Spokane, Silver Lake		250
West Virginia:		
Elkins, Tygarts Valley River	1,200	
Morgantown, Dunkard Creek		300
Neola, Anthony's creek	4,000	
Wisconsin:		
Armstrong Creek, Lake Lama		125
Cable, Buffalo Lake	3,000	
Prairie Lake	2,000	
Price's lake	2,000	
Elcho, Lake Nine		250
Grandview, Diamond Lake		200
Hoosier Lake	2,000	
Hayward, Spider Lake	2,000	
Nye, Lake Nokomis	2,000	
Mirror Lake	3,000	
Tuttle Lake, Silver Lake	2,000	
Wyoming:		
Tody, Wiley's lake		250
Total [a]	232,312	78,940

LARGE-MOUTH BLACK BASS.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Alabama:		
Andalusia, Cawthon's pond		300
Knox Pond		8,000
Anniston, Cane Creek		4,000
Coldwater Creek		2,000
Hillabee Creek		1,000
Neskitt's lake		2,000
Shoal Creek		1,000
Tallassahatchie Creek		2,000
Upper Cane Creek		2,000
Atmore, Spring Creek		2,000
Bear Creek, Bear Creek		175
Bellamy, Allison Lake		1,000
Glendale Lake		1,000
Bessemer, West Lake		2,000
Boguechitto, Dry Creek		2,000
Boligee, Bouchelle's pond		1,000
Buffalo, Mill Pond		1,000
Carson, Baptism Branch		4,000
Chesterfield, Mill Creek		1,300
Mountain Creek		1,000
Silver Creek		1,000
Childersburg, Tallahatchee Creek		3,800
Clayton, Nix's pond		3,000
Alabama—Continued.		
Cuba, Alamutchee River		2,000
Pretty Creek		2,000
Cypress, Warrior River Cut-off		2,000
Dadeville, Buck Creek Pond		1,000
Oil Mill Pond		2,000
Dothan, Moats' pond		250
Five Points, Whatley's pond		1,000
Gadsden, Hollis Spring		250
Goshen, Conecuh River		2,000
Folman's pond		1,000
Grady, Tucker's pond		1,000
Greensboro, Warrior River		1,500
Guin, Beaver Creek		175
Beaver Creek Pond		175
Hel. Creek		175
Purgatory Pond		175
Hartford, Damon Pond		2,000
Daughtry Pond		400
Glover's pond		2,000
McNeal's pond		2,000
Headland, Bird Fish Pond		2,000
Kirkland's pond		1,000
Heflin, Big Tallapoosa River		2,000
Hull, Lake Artesia		1,000

[a] Lost in transit, 2,500 fry and 4.014 fingerlings.

Details of Distribution—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Alabama—Continued.		
Iron City, Choccolocco Creek		2,000
Jackson, McDonald's pond		1,500
Lincoln, Choccolocco Creek		2,000
Livingston, Alamuchie Creek		2,000
Sucarmotchee Creek		3,000
Linn, Blackwater Creek		175
Marion, Long's pond		500
Spring Branch		1,000
Neenah, McCracken's pond		1,000
Pratt City, Glover's lake		1,000
Ramer, Sullivan's pond		1,000
Waller's lake		1,000
Repton, Pritchett's pond		125
Springbranch pond		70
Roden, Little Warrior Creek		1,300
Russellville, Cobbs Spring Pond		175
Seale, Longview Lake		2,000
Selma, Boggs Pond		90
Hooper Pond		90
Houston Pond		90
Pretty Pond		90
Smith's pond		90
Troy, Big Creek		2,000
Tuscumbia, East Sheffield Lake		175
Spring Creek		350
Tuscumbia Spring		175
Union Springs, Clear Pond		1,500
Eley's pond		750
Yolande, Davis Creek		4,000
Spring Pond		400
Arizona:		
Flagstaff, Lake Mary		550
Yuma, Colorado River		400
Arkansas:		
Alma, Big Clear Creek		150
Altus, Cedar Creek Lake		100
Arkadelphia, Spring Pond		200
Atkins, Hacker Creek		150
Point Remove Creek		3,000
Bellefonte, Eagle Lake		100
Bigger, Current River		1,250
Camden, Bradley Lake		2,000
Mustin Lake		2,000
Helena, Lake Solomon		500
Hot Springs, Fordyce's lake		300
Junction, Bailey's pond		200
Lake Village, Lake Chicot		1,000
Lewisville, Lester's pond		150
Magnolia, Stevens's pond		1,500
Wyrick's pond		1,500
Malvern, Crystal Lake		1,000
Watervalley Pond		1,000
Ozan, Goodlett's pond		1,000
Pine Bluff, Hill's pond		1,500
Vick's pond		1,500
Pocahontas, Black River		1,250
Rich Mountain, Washita River		100
Rottaken, Big Lake		400
Clear Creek		400
Fish Creek		400
Pennington Bayou		400
Wolf Bayou		400
Scott, Mound Lake		4,000
Stamps, Lake Lucile		100
Texarkana, Chapman's pond		50
Van Buren, Cazort's lake		100
Cottonwood Lake		100
Ned Lake		100
Wilmot, Lake Enterprise		150
Woodson, Ferguson's lake		2,000
Colorado:		
Glacier Lake Station, Glacier Lake		250
Greeley, Windsor Lake		200
Manzanola, Sickenberger's Lake		175
Florida:		
Escambia County, Beaverdam Pond		3,000
Georgia:		
Albany, Kinchapoonee Creek		1,000
Muckalee Creek		1,000
Ralls Pond		500
Atlanta, Roberts' pond		2,000
Augusta, Fish Club's pond		2,000
Hagler's pond		125
Redds Creek		1,000
Bullochville, Parkman's pond		7,000
Commerce, Dowdy Branch Pond		1,000
Nails Creek Pond		750
Stark's pond		500
Dearing, Howard's pond		1,000
Greensboro, artificial pond		1,125
Griffin, Brooks' pond		500
Hampton, Willow Pond		1,000
Hogansville, Burdett's pond		1,000
Jefferson, Oconee River		2,000
Louisville, Mansan Branch Pond		400
Menlo, Major's pond		150
Mount Airy, Cox Creek		1,500
Hazen Creek		2,000
Nancy Long Creek		1,500
Piter Creek		1,500
Norwood, Middle River		2,000
Palmetto, Winkles' pond		1,200
Perry, Bay Creek		1,500
Tharps Mill Pond		2,000
Toomer's pond		2,000
Roswell, Roswell Lake		4,000
Senoia, Hogg's pond		1,000
Whiteoak Creek		1,000
Stone Mountain, Stone Mountain Lake		1,000
Talbotton, Wilson's pond		800
Upatoie, McMurram Pond		1,000
Williamson, Rosecreek Mill Pond		500
Winder, Mulberry Creek		1,000
Illinois:		
Algonquin, Fox River		300
Alpha, Crescent Lake		80
Anna, Hess Pond		50
Antioch, Channel Lake		300
Echo Lake		250
Lake Marie		1,100
Lake Petite		300
Loon Lake		250
Aurora, Fox River		80
Barrington, Lake Zurich		300
Belleville, St. Nicholas Pond		50
Belvedere, Kiswaukee River		100
Bloomington, Brewery Lake		80
Brighton, North Star Lake		50
Bristol, Barns' pond		40
Brownsburg, Hoffman's pond		100
Carbondale, Bryan Lake		50
Carbondale Lake		50
Dillinger Lake		50
Taylor's lake		50
Teeter's lake		50
Turtle Lake		50

Details of Distribution—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Illinois—Continued.		
Carrollton, Fairgrounds Lake		50
Rainey's lake		50
Carter, Wellman's pond		200
Carterville, Burr's pond		100
Coleman's lake		125
Ferrell's lake		100
Hampton's lake		100
Pope's pond		200
Zimmerman's lake		200
Chicago, Bridewell Lake		40
Chrisman, Light Pond		50
Columbia, Gilmore Lake		250
Crystal Lake, Crystal Lake		300
Dallas City, Mississippi River		1,000
East St. Louis, Hilltop Lake		600
Edenburg, Stewart's pond		100
Edwardsville, Banner Lake		200
Effingham, Hoffman's pond		100
Spring Pond		100
Freeburg, Mill Pond		50
Reichert Mill Pond		50
Freeport, Pecatonica River		200
Gillespie, Spring Lake		100
Grays Lake, Druses Lake		200
Grays Lake		200
Henderson, Rice Branch		80
Highland, Oakhill Lake		50
Hillsboro, Chatauqua Lake		50
Glen Creek		50
Major's pond		50
Jewett, Woodbury's lake		800
Johnston City, Stiritz Lake		100
Lewiston, Hinds' pond		80
Litchfield, Chatauqua Lake		250
Marshall, Big Creek		200
East Mill Creek		200
Harlan's pond		40
Little Creek		200
West Mill Creek		200
Mascoutah, Gebbie's lake		50
Mattoon, Waterworks Reservoir		80
McHenry, McCullum Lake		80
Momence, Kankakee River		160
Mount Vernon, Waterworks Reservoir		300
Murphysboro, Carbon Lake		600
Naperville, Branch DuPage River		160
Nashville, Karls Bait Lake		100
New Brownfield, Alder Spring Lake		150
Noble, Weidner's pond		100
Olney, City Reservoir		300
Paris, Reservoir Park Lake		80
Reevesville, Otter Lake		50
Richmond, Lake Elizabeth		300
Twin Lakes		300
Rossville, Mann Pond		40
Salem, Fyfe s lake		100
Rainey's lake		100
Savanna, Mississippi River		1,100
Shelbyville, Spring Lake		100
Shepherd, Sni E'Carte River		150
Shipman, Brantigam's pond		50
Sparta, Shop Pond		100
Spring Pond		100
St. Clair County, Weber's lake		50
Tonti, Woodland Lake		100
Waltonville, Hulbert's pond		175
Waterloo, Beaver Lake		50
Bissell Lake		50
Bostwicks Lake		50
City Lake		50
Lake Bartlett		50
Illinois—Continued.		
Waterloo, Mill Pond		50
Vogt's lake		50
Wetaug, Stoner's pond		50
Winnetka, Singer's pond		80
Indiana:		
Albion, Muncie Lake		150
Alexandria, Sullivan s pond		200
Anderson, Crystal Lake		100
Angola, Bass Lake		200
Argos, Huff's lake		100
Attica, Big Pine River		300
Hunter Pond		300
Kates Pond		300
Shawnee Creek		300
Aurora, North Hogan Creek		400
Bass Lake, Bass Lake		250
Batesville, St. Clairs Pond		200
Bloomfield, Beech Creek		150
Clifty Creek		150
Doans Creek		100
Plummer Creek		150
Bloomington, Axtell's lake		75
Boonville, Caledonia Lake		150
Lake Lucile		150
Brazil:		
Highland Pond		100
McGregar's pond		100
Stough's pond		100
Brooklyn, Bankers Lake		50
Cambridge City, Martindale Creek		200
Whitewater River		150
Carlisle, Gills Prairie Ditch		75
Castleton, White River		300
Cedar Lake, Cedar Lake		270
Chandler, Locust Ponds		150
Charleston, Fourteenmile Creek		150
Chesterton, Clear Lake		40
Claypool, Caldwell Lake		150
Columbia City, Loon Lake		200
Columbus, Whiterock Creek		200
Connersville, Watson Pond		100
West Fork White River		125
Coridon, Big Indian Creek		200
Crete, Greenville Creek Pond		100
Crown Point, Junker Pond		100
Cutler, Wildcat Creek		150
Daleville, Cummins Lake		100
Delaware, Silver Lake		200
Edinburg, Blue River		200
Sugar Creek		200
Ellsworth, Forest Park Lake		150
Evansville, Brewery Pond		150
Hetzel's pond		55
West Heights Park Lake		150
Fairmount, Backcreek Gravel Pit		100
Triple Gravel Pit		100
Farmland, Mills Lake		100
Ft. Wayne, Silver Lake		150
Gaston, Gravel Pit		100
Greenwood, Shannon s Lake		150
Griffin, Black River		150
Hamilton, Watkins lake		200
Indianapolis, Big Eagle Creek		150
Crystal Springs Pond		50
Eagle Creek		150
Little Eagle Creek		100

DETAILS OF DISTRIBUTION—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Indiana—Continued.		
Jamestown, Henry's pond		50
Jonesboro, Galatia Lake		100
Kentland, Kent's pond		100
Kewanna, Bruce Lake		150
Kingsland, Oaklawn Pond		100
Knightstown, Watts Lake		50
Lafayette, Lake Elm		100
Lagrange, Cedar Lake		200
Cline Lake		100
Fish Lake		150
Gages Pond		100
Lake Gage		200
Oliver Lake		150
Weir Lake		150
Lake Cicott, Lake Cicott		150
Lapel, Aldred's pond		100
Lawrenceburg, East Fork Creek		250
East Fork Tanners Creek		250
Tanners Creek		400
West Fork Creek		250
Leesburg, Tippecanoe Lake		400
Liberty, East Fork Whitewater River		125
Ligonier, Diamond Lake		150
Lima, North Twin Lake		200
Twin Lake		200
West Twin Lake		200
Lincoln City, Lincoln City Pond		150
Losantville, Johnson's lake		100
Macy, South Mud Lake		200
Manilla, Big Flatrock River		200
Martinsville, Sherman's pond		50
Metamora, Ice Pond		100
Milam, Milam Pond		250
Milltown, Big Blue River		550
Monticello, Tippecanoe River		150
Mulberry, Wildcat Creek		150
Muncie, Retherford s pond		100
North Liberty, Rupel Lake		100
Oakland City, Cockrum's pond		200
Oakland City, Waterworks Lake		200
Orleans, Blue Spring Pond		75
Osgood, Stone Quarry Pond		50
Petersburg, Lake Shannon		150
Pierceton, Ridinger Lake		200
Webster Lake		200
Plymouth, Pretty Lake		200
Ray, Clear Lake		200
Sellersville, Silver Creek		200
Shelburn, Jackson Hill Reservoir		60
South Bend, Bass Lake		200
Marl Lake		200
St. Joseph Lake		300
Spencer, Freshwater Pond		50
Terre Haute, Buffalo Pond		50
Greenfield Bayou		150
Lake Fluvanna		100
Valparaiso, Wahub Lake		80
Vincennes, East Lake		60
Wawasee, Lake Wawasee		200
Winchester, Maple Lake		100
Sugar Creek		100
Winona, Winona Lake		200
Wolcott, Sand Plant Pond		100
Wynn Station, Bruce Lake		200

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Iowa:		
Amana, Iowa River		150
Neubauer Lake		300
Anamosa, Buffalo River		400
Wapsipinecon River		400
Bellevue, Mississippi River		1,100
Brighton, Crippend Slough		300
Skunk River		300
Cedar Falls, Cedar River		400
Chariton, railroad reservoir		800
Charles City, Cedar River		400
Chester, Upper Iowa River		500
Clayton, Mississippi River		3,250
Clear Lake, Clear Lake		1,200
Decorah, Upper Iowa River		600
Delhi, Maquoketa River		1,200
Elkader, Turkey River		800
Fairfield, Fairfield Lake		1,300
Fayette, Volga River		800
Harlan, Nelson's pond		300
Kellerton, McGhuey's pond		300
Kingsley, Elkhorn Pond		200
Lime Springs, upper Iowa River		500
Manchester, Maquoketa River		1,000
Maquoketa, Maquoketa River		1,600
New London, Lake Sunapee		300
North McGregor, Mississippi River		3,250
Northwood, Silver Lake		400
Spirit Lake, Spirit Lake		300
Stacyville, Little Cedar River		400
Sumner, Robertson's pond		500
Waterloo, Cedar River		1,000
Winterset, Alexander Park Pond		150
Kansas:		
Belmont, Lake Orsemus		100
Caldwell, Fall Creek		150
Canada, Siebert's pond		400
Cawker City, Oak Creek		600
Coldwater, Carter lake		100
Craig, Burger's Lake		150
Elbing, Henry Creek		60
Eureka, Otter Creek		200
Fredonia, Rainbow Creek		350
Gaylord, Solomon River		600
Holliday, Twin Springs		375
Hoyt, Little Soldier Creek		500
Kansas City, Riverview Lake		150
Kingman, Home Park Pond		100
Leoti, Klapperthal Lake		150
Long Pond		150
Manhattan, Wildcat Creek		300
Marion, Gruno Creek		200
Clear Creek		400
Cottonwood River		250
French Creek		250
Lula Creek		200
Martin Creek		200
Middle Creek		300
Rainbow Lake		150
South Cottonwood River		250
Medicine Lodge, Chapin Pond		163
Medicine Lodge Ditch		525
Swartz's pond		162
Morland, Day Creek		200
Olathe, Lake Nenteton		250
Peabody, Doyles Creek		200
Henry Creek		200

Details of Distribution—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Kansas—Continued.		
Peabody, Rock Island Lake		200
Spring Branch		150
Pittsburg, Porter's pond		50
Rosedale, Bellinder's pond		150
Soldiers Home, Lake Sunset		100
Stafford, Waterworks Lake		125
Wakarusa, Wakarusa Creek		150
Welda, Santa Fe Reservoir		100
Zenith, Ninnescoh Lake		200
Kentucky:		
Adairsville, Dyars's pond		100
Mason's pond		100
North Fork Red River		300
Red River		200
Simmons Mill Pond		100
South Fork Red River		200
Spring Creek		100
Allensville, Donaldson's pond		100
Corby's pond		100
Gill's Pond		100
Robertson's pond		100
Sunnyside Pond		100
Anchorage, Crystal Lake		200
Spring Lake		200
Auburn, Clark's pond		100
Clearfork Creek		200
Freeman's pond		100
Jasper River		200
Hall's pond		100
Hughes's pond		100
Prices Creek		100
Ray's pond		100
Scott's pond		100
Wilkerson's pond		100
Austerlitz, Gaitskill's pond		200
Bagdad, Bailey's pond		200
Nancy's pool		125
Bardstown, City Reservoir		250
Beattyville, Kentucky River		350
Berea, Lake Lloyd		200
Bloomfield, Miller's lake		250
Bowling Green, Barren River		600
Cook's lake		75
Cook's pond		75
Drakes Creek		500
Gasper River		200
Mitchell's lake		75
Plano River		200
Sturgeon's pond		75
Woods Pond		75
Bracht, Hopkins' pond		100
Buckners, Harrods Creek		400
Burgin, Big Pond		200
Burlington, Locust Lake		200
Cadiz, Sinking Fork Creek		100
Campbellsburg, La Master's pond		200
Campbellsville, Green River		350
Catlettsburg, Big Sandy River		350
Cave City, Huggins' pond		150
Reynolds' pond		150
Covington, Latonia Lake		400
Riches Pond		400
Sandford Pond		200
Crayneville, Cardin's pond		150
Crittenden, Allphin's pond		100
Hudson's pond		100
Moore's pond		100
Wilson's pond		100
Cropper, Flood's pond		200

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Kentucky—Continued.		
Cumberland Falls, Cumberland River		400
Cynthiana, South Licking River		500
Danville, Dicks River		350
Dawson, Brewers Spring Lake		150
Donerail, Harkness Lake		300
Ekron, Doe Run		200
Elizabethtown, Fontainbleau Creek		200
Glenrose Pond		200
Middle Creek		200
Ray's pond		150
Rhudes Creek		200
Valley Creek		200
Elkton, Kirkman's pond		200
Eminence, Basket's pond		200
Distillery Pond		200
Duncan's pond		200
Gains' pond		200
Haymaker's pond		200
Moncallo Pond		200
Robinson's pond		200
Horne's pond		200
Williams' pond		200
English, Gullion's pond		200
Erlanger, Beeches North Pond		300
Erlanger Fair Lake		300
Escondia, Green Creek		100
Armours, Freestone Pond		125
Ferguson, Whippoorwill Creek		200
Frankfort, Sullivan's pond		125
Franklin, Bradshaw Pond		100
Calverts Pond		100
Douglas Pond		100
Drakes Creek		400
Herrington's pond		75
Nunah Pond		100
Red River		200
Sharps Pond		200
Spring Creek		200
Sulphur Fork Creek		600
Turner's pond		200
Wright's pond		75
Fredonia, Elm Pond		150
Koon's pond		200
Lake Darby		150
Meadow Lake		150
Shelby Pond		150
Willow Lake		150
Willow Pond		150
Young's lake		200
Georgetown, Bradley's pond		200
Burch Pond		200
Elkhorn Creek		350
Grover's pond		200
Rucker's pond		200
Glasgow, Skegg's creek		250
Glendale, Morin River		250
Gracey, Big Pond		50
Robertson's pond		200
Greenbrier, Lake Greenbrier		200
Guthrie, Allensworth's pond		100
Deep Pond		100
Duffy's pond		100
Elk Fork Creek		200
Kays Pond		100
Lowdermilk Pond		100
Newton's pond		100
Northington's pond		100
Old Hadensville Pond		200
Pinchen Pond		100
Taliaferro Pond		100

Details of Distribution—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Kentucky—Continued.		
Guthrie, Taylor's pond		100
Wilson's pond		100
Harlan, Martins Creek		300
Henderson, Strong Water Lake		150
Hodgenville, Atherton's pond		150
Gunn's pond		150
Dutch Fork Nolan Creek		150
Slaughter's pond		150
South Fork Nolan Creek		150
Sowars' pond		150
Turner Pond		150
Hopkinsville, Garner's lake		50
Little River		100
Twyman's pond		50
Horse Cave, Bryan Pond		125
Duck Lake		150
Grass Pond		150
Little Barren River		200
Newberry's pond		150
Pemberton's pond		300
Rayland Pond		200
Steen's pond		150
Straver's pond		125
Howell, Cedar Pond		150
Jett, George Pond		200
Henton's pond		200
Johnson Junction, Allen's pond		200
Fant's pond		200
Park Lake		300
Julian, Lake Howell		100
Wadlington's lake		200
Kennedy, Barker's pond		100
Steephill Pond		100
Lakelands, Lakelands Lake		300
Lawrenceburg, Cedar Brook Lake		200
Lake St. John		200
Lebanon, Croyds Creek		200
Hardins Creek		200
Indian Lick Creek		200
North Fork Creek		200
Pittman Creek		200
Southfork Creek		200
Wood Hill Pond		200
Leitchfield, James Pond		150
Lexington, Arlington Lake		300
Livingston, Laurel Creek		250
London, Rockcastle River		650
Southfork Creek		650
Louisville, Silver Lake		800
Ludlow, Ludlow Lagoon		400
Maceo, Taylor's pond		100
Madisonville, Spring Lake		150
Marion, Electric Lake		200
Metz, White Villa Lake		800
Middlesboro, Fern Lake		500
Midway, Slack's pond		200
Millersburg, Hinkston Creek		350
Mount Sterling, Hill Pond		200
Kalorama Lake		200
Stoner and Atkinson Pond		200
Natural Bridge, Graining Black Creek		300
Kentucky—Continued.		
Nazareth, Trinity Lake		200
Nebo, Coal Company's pond		150
Newstead, Riley's pond		100
Nolin, Nolin River		300
Olmsted, Huff's pond		100
Orchard Pond		100
Spreadeagle Pond		100
Willow Pond		100
Otter Pond, Thompson's pond		50
Paris, Adair's pond		250
Alf Clay Pond		200
Bedford Pond		200
Blacks Pond		200
Bluegrass Pond		200
Bradley's pond		200
Brannon's pond		200
Brush Pond		200
Burke's pond		200
Burr Pond		200
Campbell's pond		200
Clay's pond		200
Collins Pond		200
Cooper Davis Pond		200
Elgin's pond		300
Ferguson's pond		200
Forest Lake		200
Goff's pond		200
Goodman's pond		200
Hall's pond		200
Hedges' pond		200
Herring's pond		200
Hilltop pond		200
Holliday Pond		200
Houston Creek		200
Huggins Pond		200
Leer's pond		200
Logan's pond		200
Mappin's pond		200
McClure Pond		200
Monterey Pond		200
Moran Pond		200
Myall's pond		200
Offutt's pond		400
Penn's pond		200
Renick Pond		200
Sandusky Pond		200
Shanty Woods Pond		200
Smith's pond		400
Strodes Creek		200
Turner's lake		200
Whaley Pond		200
White's pond		200
Wilson's pond		250
Wyatt Pond		200
Paynes Depot, South Elkhorn Creek		300
Pembroke, Dickinson's pond		100
Fulcher's pond		100
Pikeville, Big Sandy River		750
Pleasureville, club pond		200
Prestonsburg, Big Sandy River		400
Princeton, Garrett's pond		150
Redoak, Little Whippoorwill Creek		200
Richwood, Robinson's pond		250
Rockyhill, Slew Pond		150
Russellville, Dickinson's pond		75
Harper's pond		75
Rock Quarry Lake		75
Sugg Pond		75
Sadieville, Big Eagle Creek		300
St. Marys, Beaven's pond		150

Details of Distribution—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Kentucky—Continued.		
St. Marys, Smock's pond		150
Sanders, Carlisle's pond		200
Shawhan, Patton's pond		200
Shelbyville, Boyd's pond		200
Harbison's pond		100
Simpsonville, Woodlawn Pond		200
Slaughters, Slaughterville Lake		200
Smithfield, King's pond		200
Smiths Grove, Barron River		300
English Ponds		250
South Union, McCuchen's pond		200
Sparta, Sanford's pond		400
Springfield, Cartwright's creek		250
Stanford, Buffalo Lake		250
Dicks River		250
Hanging Fork Creek		250
Noblick Creek		250
Stithton, Bogard's pond		100
Trenton, Camp's pond		100
Carry's pond		100
Mimm's pond		100
Red Pond		100
Rock Quarry Pond		100
West Fork Red River		200
Vanceburg, Kinnickonick River		700
Vine Grove, Otter Creek		150
Williamstown, Lake Obispo		100
Wilson, Wilson's pond		150
Winchester, Evans' pond		200
Wheeler Lake		250
Woodburn, Drakes Creek		200
Sloss' pond		100
Louisiana:		
Athens, Dutton Pond		100
Bayou Paul, Bayou Paul Pond		125
Bonita, Brake Pond		325
Campti, Gasconne Pond		100
Casper, Lock's pond		100
McInnis' pond		100
Chopin, Tousselle Lake		100
Franklin, Head Lake		200
Lake Providence, Lake Providence		350
Laurel Hill, Bayland Pond		200
Leesville, Castor Creek		300
Mansfield, Prude's pond		100
Myrtis, Margetich's pond		50
Napoleonville, Godchaux Canal		200
Natchitoches, Breazeal's pond		100
Chaplin's lake		100
Kile's lake		100
Old River Bed		100
Spring Lake		300
New Iberia, Willow Lake		125
New Orleans, City Park Lake		250
Orangeville, Conerly Mill Pond		187
East Anacoco Creek		188
Pineville, Clear Pond		100
Powhatan, Fish Hole Lake		100
Provencal, Kissatchie Creek		150
Robeline, Cassady's pond		100
Hendrick's pond		100
Gordon Pond		100
Manheim Pond		100
Selma, Selma Pond		100
Louisiana—Continued.		
Stonewall, Nelson's pond		100
Wisner, Hess Pond		275
Hicks Pond		225
Kennedy's pond		275
Parker's pond		275
Maine:		
Belgrade Lakes, Great Lake		684
Maryland:		
Allegheny County, Town Creek		400
Forest Glen, Macs Jolly Lake		100
Mount Calvert, Patuxent River		100
Oakland, Youghiogheny River		500
Michigan:		
Allegan, Dumont Lake		250
Alpena, Brush Lake		300
Long Lake		300
Au Sable, Van Ettan Lake		200
Austin, West Lake		300
Buchannan, Clear Lake		300
Cassopolis, Diamond Lake		300
Cheboygan, Cheboygan River		200
Long Lake		200
Comins, Bass Lake		200
Crystal Falls, Lake Mary		600
East Tawas, Indian Lake		280
Edwardsburg, Eagle Lake		300
Greenville, Turk Lake		200
Hart, Mud Lake		200
Ironwood, Eaton's lake		250
Lake Pomeroy		200
Sunday Lake		200
Tamarack Lake		600
Taylor Lake		200
Kalamazoo, Lake View		300
White's lake		300
Lawrence, Christies Lake		300
Fiske Lake		300
Halls Lake		300
Lake Cora		300
Monroe Lake		300
Pitchers Lake		300
Prospect Lake		300
Shaffers Lake		300
Lawton, Cedar Lake		300
Lincoln, Clear Lake		300
Lupton, North Lake		180
Rifle Lake		180
Manistee, Borenstein's lake		150
Muskegon, Bear Lake		250
Little Black Lake		250
Muskegon Lake		250
Wolf Lake		250
New Richmond, Kalamazoo River		400
Onawa, Black Lake		200
Orient, Lassen's lake		150
Pennfield, Deep Lake		250
Goose Lake		200
Pine Lake		250
Rose City, Peterhouse Lake		200
Twin Lakes		280
Spring Lake, Spring Lake		300
Traverse City, Boardman Lake		250
Minnesota:		
Alexandria, Carlos Lake		150
Lake Agnes		125
Lake Darling		250
Lake Henry		125
Lake L'Homme Dieu		125

Details of Distribution—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Minnesota—Continued.		
Alexandria, Lake Victoria		150
Barrett, Barrett Lake		250
Brownsville, Mississippi River		1,850
Duluth, Sunset Lake		300
Elbow Lake, Pomme de Terre Lake		250
Emmons, Stateline Lake		400
Grey Eagle, Big Birch Lake		250
Leroy, Wildwood Mill Pond		400
Madealia, Fedge Lake		300
Mazeppa, Mazeppa Lake		300
Osakis, Osakis Lake		250
Pine City, Cross Lake		300
Rochester, Cascade Creek		300
Lake Shady		300
South Branch Zumbro River		300
Royalton, Rice Lake		300
St. Paul, Minnesota Fish Commission		3,300
Smiley, Midway Creek		150
Pelican Lake		600
Walker, Long Lake		150
Mississippi:		
Aberdeen, Horse Shoe Lake		150
Quofoloma Lake		150
Baldwyn, Gholston's lake		375
Bentonia, Woodbine Pond		125
Bodga, Adams' pond		150
Bodga Pond		150
Cochrane and Harrington's pond		150
Bolton, Lake Chateau		200
Lily Pond		200
Moonshine Lake		200
Bovina, Davis Creek		200
Brandon, Busick's pond		100
Centerville, McKee's pond		100
Clarksdale, Sunflower River		250
Corinth, Billswell Lake		125
Meador Lake		125
Cotton Plant, Darkley's pond		125
Crawford, Flournoy's pond		150
Crenshaw, Delta Pond		125
Darling, Bear Lake		200
Edwards, Ballard's pond		100
Brichetto Spring		100
Kidd Lake		125
Mount Moriah Pond		100
Enterprise, Helms' pond		150
Flora, Bradley's pond		150
Glendora, Graham's pond		125
Gloucester, Berryhill's pond		200
Clear Creek		225
Jackson's pond		125
Long Branch		125
Robinson's pond		100
Greenville, Valley Pond		425
Grenada, Denham Lake		200
Spring Lake		200
Gulfport, Bogg's bayou		200
Hamburg, Cloy's lake		100
Courthouse Branch		150
Lehmann's pond		100
Montgomery Lake		100
Hardy Station, Martin's pond		225
Hazlehurst, Crystal Lake		150
Crystal Pond		125
Dampeer's pond		150
Hazlehurst Lake		500
Lake Borard		125
Lake Catherine		450
Sapphire Lake		200
Heidelberg, Dantzler's pond		100
Dowling's pond		100
Mississippi—Continued.		
Heidelberg, Huddleston's pond		100
McDonald's pond		100
Walker's pond		100
Hermanville, Talbot Pond		250
Holly Springs, Boone's pond		125
Wall's pond		100
Howard, Wallace's pond		125
Jackson, Belle Hover Pond		150
Floral Park Lake		125
Patton's pond		125
Power's pond		150
Knoxville, Thomas's pond		100
Kosciusko, Cottrell Lake		200
Laurel, Lily Pond		100
Lexington, Rhyne's pond		125
Liberty, Anderson's pond		100
Long Beach, Wolf River		300
Louisville, Cagle's pond		125
Gully's pond		125
Watson's pond		125
Maben, Thomas's pond		250
Macon, Bush's pond		150
Chowchow Pond		150
Eiland Pond		300
Frith Lake		150
Howards Lake		300
Hunter's pond		150
McIntosh Pond		150
Swann's pond		150
Magnolia, Hurricane Creek		200
Mantee, May's pond		125
Mayhew, Garth's pond		150
Rand's pond		150
McCrary Spring Branch		150
Meridian, Carpenter's pond		100
Mill Brook Lake		100
Trout Lake		125
Waterworks Pond		2,000
Michigan City, Cheairs Pond		125
Miller, Miller's pond		275
Mineral Wells, De Soto Wells Lake		125
Natchez, Greenfield Pond		100
Toothpick Pond		150
Newton, Kennedy's pond		100
Richardson's mill pond		125
Okolona, Walton's pond		375
Olive Branch, Bridgeforth's pond		125
Oxford, Wilson Lake		125
Pachuta, Aldredge's mill pond		100
Phalti Lake		125
Pocahontas, Pocahontas Pond		150
Prentiss, Goodwin's lake		100
Purvis, Beaverdam Creek		150
Big Block Creek		250
Mossie Pond		125
Raymond, Dillon's pond		125
Eggleston's pond		100
Gibbs' pond		100
North's pond		125
Ridgeland, Ridgeland Lake		100
Ripley, Mauney's pond		200
Russum, Callender's pond		125
Scooba, Webb's pond		50
Seminary, Hugh Branch		250
Sessams, Askew's ponds		200
Fox Lake		100
Henry's pond		100
Lance's pond		100

Details of Distribution—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Mississippi—Continued.		
Sessams, Shadygrove Lake		100
Shuqualak, Anderson's ponds		300
Combs's ponds		300
Kirk's ponds		150
Park Lake		150
Pinegrove Pond		150
Welsh's pond		150
Wigwam Pond		150
Woodlawn Pond		150
Starkville, McPherson Lake		200
Mill Pond		100
Wellborn's pond		100
William's pond		150
Tchula, Alligator Lake		150
Belmount Lake		100
Tupelo, Park Lake		200
Wallerville, Stevenson's pond		100
Waynesboro, Chapman's pond		150
Lang Creek		150
McAlister's pond		100
Mapleville Pond		150
Pattons Creek		150
Wilson's pond		150
West Point, farm pond		150
Whittaker, Freshwater Pond		100
Winona, Howard's pond		125
Woodville, McGehee's pond		100
Yazoo City, Wolf Lake		300
Missouri:		
Aurora, James Fork White River		500
Blackburn, Railroad Lake		300
Branson, White River		1,000
Brunswick, Cut-off Lake		600
Butler, Christy's lake		150
Cabool, Onyx Cave Lake		800
Chillicothe, Stone's lake		125
Crane, Railroad Pond		3,300
Doniphan, Owenmont Pond		500
Harrisonville, Lake Luna		250
Humansville, Merchants Haunt Pond		150
Kansas City, Kenefick's lake		200
Keytesville, Crapper and Cunningham Lakes		400
Lees Summit, Beyer's lake		100
Merwin, Limestone Pond		200
Mexico, Chicago and Alton Railroad Pond		500
Waterworks Pond		500
Nevada, Hill's pond		250
Tucker Lake		250
Orrick, Fishing River		400
Willow Springs, Far Indian Creek		800
Middle Indian Creek		800
reservoir		2,000
Montana:		
Belton, Halfmoon Lake		200
Cascade, Missouri River		100
Chouteau County, Marias River		100
Flood, Missouri River		100
Great Falls, Missouri River		100
Hardy, Missouri River		200
Helena, Hauser Lake		200
Lake Sewell		100
Kalispell, Bass Lake		200
Foys Lake		200
Horntvedt Lake		200
Montana—Continued.		
Mid Canon, Missouri River		100
Riverdale, Missouri River		100
Ulm, Missouri River		200
Nebraska:		
Albion, Beaver River		300
Bristow, Cedargrove Ranch Pond		300
Lodgepole, Oberfelder's lake		250
Milligan, Placek's pond		150
Omaha, Springvalley Lake		125
Orleans, Republican River		600
Tobias, Branch Pond		150
New Jersey:		
Bridgeton, Sheppards Mill Pond		200
Collingswood, Collingswood Lake		200
New Mexico:		
Artesia, Clark's lake		125
Clayton, Hilger's lake		150
Folsom, Honey's pond		100
French, Chicosa Lake		75
Lakewood, Holt's reservoir		125
Nara Visa, branch Agracabollo Creek		200
Raton, Simpson's lake		150
Roswell, artesian reservoir		125
artesian ponds		225
Berrendo Creek		175
Bottomless Lake		200
Country Club Lake		575
Deep Lake		150
Hondo Reservoir		200
Hurd's pond		125
Lake Gillett		125
Mullis' reservoir		125
Munro's pond		125
Patterson's pond		125
Smith's reservoir		125
South Spring River		175
Tannehill's pond		125
Wigwam Lake		500
William's pond		125
Wiseley's pond		125
San Antonio, Spring Pond		200
Santa Rosa, Black Lake		200
Three Lakes		200
Twin Lakes		200
Springer, Colmar Lake		350
Jaritas Lake		350
New York:		
Chenango Forks, Chenango River		80
Craryville, Copake Lake		150
New Paltz, Brunekill Brook		275
Hurnpo Brook		125
Mill Brook		125
Plattekill Brook		125
Shawangankkill Brook		150
Spookkill Creek		125
Wallkill River		125
Norwich, Chenango River		80
Riverside, Schroon Lake		500
Utica, Spring Pond		500
North Carolina:		
Aberdeen, Aberdeen Creek Mill Pond		150
Asheboro, Deep River Pond		133
Moulders Branch Pond		100
Benson, Minga Branch Pond		150
Brown Summit, Hardie's pond		150
Cliffs, Catawba River		35
Corapeake, Alphins Pond		100
Durham, Eno River		150

DETAILS OF DISTRIBUTION—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
North Carolina—Continued.		
Elkin, Bryant Branch		264
Fayetteville, Beaver Lake	2,000	
Blounts Creek Mill Pond		150
New Pond	2,000	
Havelock, Great Lake		400
Hildebran, Henry River Pond		35
Hillsboro, Kate Creek		150
Kenly, Keen's pond		150
Lake Waccamaw, Waccamaw Lake		800
Lilington, Springwater Pond	1,000	
Spring Pond	1,000	
Manchester, Croatan Lake		200
Manson, Nut Bush Pond		150
Mebane, Haw Creek		150
Morrisville, Brier Creek	1,000	
Sycamore Creek	1,000	
Mortimer, Mill Pond		35
North Wilkesboro, Combs' pond		264
Freestone Pond		264
Oxford, Homer's pond		210
Spring Branch Pond		225
Parkersburg, South River		250
Reedsville, Pannill's pond		198
Penn's pond		198
Salisbury, Dutch Second Creek Mill Pond		198
Earnhardt's pond		198
mill pond		196
Siloam, Greasy Creek Pond		500
Spray, Park Lake		150
Tacket Branch Pond		150
Spring Hope, Collins' pond		200
Statesville, Catawba River		115
Sunbury, Alphins Pond		100
Waynesboro, Club's lake		900
Little Westfork River		200
Wilmington, Pembroke Park Pond		400
Wilson, Gow Branch		150
North Dakota:		
Beach, Little Beaver Pond		125
Berthold, Lake View		250
Binford, Willow Lake		125
Bottineau, Lake Metigoshe		400
Larson Lake		125
Long Lake		125
Loon Lake		150
Pelican Lake		125
Cando, Big Coulee River		125
Crocus, Snyder Lake		100
Denhoff, Jones Lake		150
Devils Lake, Cavanaugh Lake		375
Devils Lake		1,890
Freshwater Lake		375
Dunseith, Rose Lake		125
Forman, Circle Lake		200
Moss Lake		200
Olson Lake		150
Kenmare, Thompson's lake		275
Upper Des Lacs		250
Lakota, Swan Lake		125
Lisbon, Anderson's pond		150
New Salem, Springbrook Pond		150
Pleasant Lake, Broken Bone Lake		125
Elm Lake		125
Rock Lake, Rock Lake		100
Rolla, Belcourt Lake		125
Rutland, Sprague Lake		200
North Dakota—Continued.		
Saint John, Coulee Creek		150
Dion Lake		85
Gordon Lake		125
Grimes Lake		100
Sims, Sims Creek		200
Turtle Lake, Long Lake		250
Velva, Potters Lake		250
Spring Creek		250
White Earth, Powers Lake		150
Ohio:		
Amelia, Sigel's pond		200
Aurora Station, Harmons Pond		200
Bannock, Wheeling Creek		700
Bedford, Bedford Pond		150
Schneider's pond		150
Belle Valley, Laura Mine Reservoir		100
Brooklyn, Chester's pond		100
Canfield, Mahoning Lake		100
Celina, Mercer County Reservoir		950
Cincinnati, Ayer's pond		200
Cleveland, Kuenzer Pond		150
Cleves, Minges' pond		250
Columbus, Matthews Lake		250
Covington, Greenville Falls Dam		400
Dayton, Soldier's Home Lake		400
Euclid, Cherry Lake		100
Gambier, Kokosing Creek		200
Georgetown, Sylvan Lake		200
Girard, Sylvan Pond		100
Harrison, Whitewater River		400
Hudson, Mud Brook Pond		150
Lisbon, Furnace Run		100
Mineral Ridge, Coal Creek Pond		100
Mishler Station, Fritch's lake		200
Mowrystown, Whiteoak Valley Pond		200
Oakley, Monarch Park Lake		400
Portsmouth, Mill Brook Park Lake		400
Port Union, Ellis Lake		400
Ravenna, North Mahoning Creek		150
Sciotoville, Little Scioto River		400
Springfield, Cliff Lake		400
Tiffin, Sandusky River		150
Union, Stillwater River		400
Wapakoneta, Lake Mercer		600
West Farmington, Grand River		150
Youngstown, Ellmin Pond		100
Oklahoma:		
Altus, Bitter Creek		200
Stinking Creek		200
Turkey Creek		300
Apache, Cache River		300
Mission Creek		200
Spring Creek Pond		400
Ardmore, Caddo Creek		200
Chickasaw Lake		325
City Lake		500
Frensley's pond		200
Guillot's pond		150
Hickory Creek		250
Kahn's lake		200
Lancaster Lake		150
McLish's lake		150
Plainview Lake		150
Poland Lake		200
Rock Creek		200

Details of Distribution—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Oklahoma—Continued.		
Ardmore, Rod and Gun Club Creek		325
Shuman's lake		125
Silver Lake		200
Simpson's lake		250
Atoka, Brown's lake		100
Bessie, Bessie Pond		150
Blackwell, Chikaskia River		200
Cleo, Gifford's lake		125
Springdale Pond		150
Cordell, Caraway's lake		150
Marshall's lake		100
Doxey, Caruth Pond		100
Durant, Eagle Lake		200
Eldorado, Lawson's lake		100
Elgin, Elmgrove Pond		100
Spring Pond		100
Elk City, Spring Pond		125
El Reno, Peach's lake		150
Rod and Gun Club Lake		250
Enid, Clear Creek Branch		200
Shumard's pond		175
Turkey Creek		200
Frederick, Hetzel's lake		125
Garber, Crystal Pond		100
Gotebo, Grant's lake		125
Grady, Sappington's pond		150
Guthrie, Hillcrest Lake		150
Persimmon Creek Pond		200
Helena, East Branch Indian Creek		200
Unruh's lake		150
Hinton, Calumet Lake		200
Hitchcock, Sunnyside Pond		150
Hugo, Frisco Railroad Pond		200
Lockridge, Deer Creek Pond		150
Lucien, Greenvalley Lake		150
Madill, Gilbert's lake		200
Mangun, Fish Creek		262
Lake Creek		263
Marietta, Askew's pond		150
Black's pond		150
Brookshier Creek		150
Pecan Lake		200
Rod and Gun Club Lake		200
Thomas Creek		150
Twin Lakes		200
Marlow, Fincher's lake		100
Goff Lake		100
Legg's branch		125
Martin's dam		150
Pettigrew Lake		125
Rock Falls Creek		475
Spring Branch		125
Sunny View Lake		100
Waterworks Dam		200
Maud, Ogee's pond		100
Maysville, Muncrief's pond		125
Meeker, Wood Lake		100
Milburn, Horne's pond		100
Morrison, Pleasant View Pond		150
Mountain View, Foutch's lake		125
Noble, Clearbrook Pond		150
Oklahoma City, Lakeview Club Lake		325
South Branch		125
Wells' lake		150
Pauls Valley, Chickasaw Lake		100
Garvin's lake		100
Hewitt's lake		100
Oklahoma—Continued.		
Pauls Valley, Kemberlin Lake		100
Smith's lake		100
Pawnee, Wheeler's lake		200
Perry, Bear Pond		100
Crystal Pond		100
Lobsitz's pond		100
Pomeroy's pond		100
Pouder's pond		100
Seids's pond		100
Spirit Lake		100
Walker's pond		100
Pond Creek, Coldwater Creek		200
Dryfork Pond		125
Fairview Lake		150
Gentry's pond		125
Pond Creek		200
Prague, Hartwell's pond		250
Purcell, Peters's pond		150
Smith's pond		150
Ringwood, Marsh's pond		150
Shawnee, Crescent Lake		150
Wabble's pond		100
Spencer, Crutcho Creek		450
Thomas, Flexsenhar Lake		200
Tishomingo, Pennington Creek		200
Tonkawa, South Fork Arkansas River		200
Verden, Lake Franklin		150
Weatherford, Rainey's lake		150
Pennsylvania:		
Brillharts Station—		
South Branch Codorus Creek		125
West Branch Codorus Creek		125
Leola, Conestoga Creek		175
Susquehanna County, Quaker Lake		21
York, Big Conewago Lake		150
East Branch Codorus Creek		75
Little Conewago Creek		100
South Carolina:		
Cashs Depot, Hatcher Lake		1,500
Charleston, Hampton Park Lake		1,500
Columbia, Horse Shoe Lake		1,500
Johnston, Yonce's pond		1,000
Kershaw, Cook's pond		1,500
Marion, Reedy Creek Pond		500
Mullins, Little Peedee River		1,000
Lumber River		1,000
Otranto, Goose Creek Lake		1,500
Piedmont, Hurricane Creek Pond		1,500
Saluda River		3,500
Rock Hill, Catawba Power Company Pond		1,500
Sanford, Suggs Mill Pond		750
Styx, Shumpert's mill pond		1,000
Sumter, Mill Pond		125
South Dakota:		
Aberdeen, Foot Creek		150
Ohloff's pond		150
Alpena, Daleske's pond		250
Altamonte, Lonetree Lake		200
Big Stone, Big Stone Lake		200
Bruce, Lake Tetonkaha		250
Oakwood Lake		250
Cavour, Small Lake		125
Claremont, Hereford Pond		175
Johnson's pond		100

Details of Distribution—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
South Dakota—Continued.		
Corsica, Bass Dam Pond		125
Choteau Creek		200
Custer, Sylvan Lake		300
Desmet, Lake Henry		250
Spirit Lake		250
Doland, Willow Slough		150
Draper, Argo's pond		450
Estelline, Lake Poinsett		300
Eureka, Mettler's pond		150
Morlock Lake		300
Fairfax, Woerpel's pond		125
Faulkton, Artesian Pond		150
Flandreau, Sioux River		300
Forestburg, Artesian Lake		550
James River		400
Ohlson's lake		400
Gary, Cobb Creek		250
Cochran Lake		200
Gettysburg, Schreiber's pond		225
Harrold, Chapelle Creek		250
Hartford, Wall Lake		250
Highmore, Artesian Lake		125
Sardis's pond		125
Willow Pond		100
Hot Springs, Cole Brook		150
Minnekata Pond		100
Howard, Abrahamsen's pond		150
Hurley, Swan Lake		300
Huron, Hanson's pond		125
Irene, Aggergaard's pond		100
Letcher, Letcher Lake		175
Listerville, Bruce's pond		175
Loyalton, Lakebed Pond		300
Madison, Lake Herman		200
Lake Madison		250
Mansfield, Harrington's lake		175
Mitchell, Firesteel Creek		300
James River		550
Orient, Artesian Pond		125
Streif's lake		175
Parker, Vermilion River		300
Parkston, Coffee Creek Pond		150
Dry Creek		175
Goldammer Pond		150
James River		100
Neugebauer's pond		200
Plum Creek		200
Twelvemile Creek		200
Plankinton, Dugan's lake		250
Huber's lake		200
Richardsons Lake		150
Richardson's pond		250
Platte, Ellingsen's pond		125
Pierre, Farmers Lake		500
Indian Creek Dam		150
Marion's pond		375
Moulton's pond		375
Nordvolt's pond		375
White Clay Pond		150
Presho, Christenson's pond		200
Dybing's pond		200
Flag Pond		200
Fosness Dam		200
Jenson's pond		200
Johnson's pond		200
Matson's reservoir		200
Nelson's pond		200
Rocky Butte Creek Pond		200
Sams Dam Pond		225
Stevens Lake		225
Pukwana, Kaufman's pond		150
Redfield, Twin Lakes		550
South Dakota—Continued.		
Reliance, Fletcher's pond		250
Lake Russel		400
Rockham, Sinclair's lake		150
Rosebud Agency, Antelope Creek		200
Scotland, Scotland Reservoir		125
Selby, Selby Dam		200
Spencer, Wolf Creek Pond		125
Tilford, Pleasant Valley Creek Pond		150
Toronto, Fish Lake		150
Tulare, Artesian Lake		125
Golden Willow Lake		175
Tyndall, Shadeland Lake		150
Vivian, Matson's mill pond		150
Webster, Pickerel Lake		300
Wentworth, Battle Creek		175
Wessington Springs, McGregor's pond		150
Wessington Springs, Sand Creek		300
Wolsey, Barber's lake		300
Oslund's lake		300
Woonsocket, Ammason Lake		150
Yankton, James River		300
Wonderland Lake		150
Tennessee:		
Ashland City, Marrowbone Pond		50
Sycamore Creek		50
Atoka, Kimbrough's lake		200
Avondale, Station Camp Creek		175
Brownsville, Drain Lake		50
Horse Shoe Lake		50
Burns, Jones Creek		175
Cedar Hill, Sulphur Fork Red River		200
Chattanooga, Grant Lake		100
Lookout Creek		100
Park Lake		125
Spring Creek		100
Clarksville, Highpoint Lake		50
Cumberland City, Wells Creek		100
Donelson, Whitworth Lake		350
Dresden, Freeman's pond		100
Gallatin, China Lake		175
Johnson Pond		50
Station Camp Creek		50
Hartsville, Harsley's pond		175
Knoxville, Knob Fork Creek		750
Lewisburg, Fowler's pond		175
Louisville, Taylor Creek		1,500
Madisonville, Craighead Lake		750
McEwen, Hooper's pond		175
Hurricane Creek		175
McKenzie, Clear Creek		200
Memphis, Conway's lake		300
Murfreesboro, Stone River		175
Nashville, Alston's pond		50
Ogeedaukee Pond		100
Nunnellys Station, Piney Creek		175
Pegram, Harpeth River		375
Rockwood, Lake Roan		300
Sadlers, Gulfport Creek		200
St. Blaise, Station Camp Creek		200
Trenton, Johnston's pond		100
Waverly, Bear Creek		175
Trace Creek		350
Texas:		
Alba, Johnson's pond		50
Alto, Harrison's pond		50
Power's lake		50

Details of Distribution—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Texas—Continued.		
Alvarado, Cotton Oil Mills pond		150
Avinger, Lake Webb		200
Bonita, Barcus Creek		300
Britton, Chrisman's lake		60
Bryan, Danby's pond		100
Calvert, Beard's lake		100
Country Club Lake		250
Campbell, Railroad Pond		50
Clarksville, Deer Lake		150
Clifton, Childress Creek		500
Meridian Creek		500
Coleman, tributary Indian Creek Pool		100
Collinsville, Forbes's pond		150
Columbus, Clapp's lake		100
Corsicana, Barth's pond		100
Caldwell's pond		100
Fish Association's pond		500
McClure's pond		50
Ransom's pond		100
Refining Company's ponds		600
Cotulla, Harris Lake		150
Woodwards Lake		200
Craft, Dover's pond		50
Crockett, Lacy's pond		300
Cumby, Railroad Pond		50
Dallas, Wah Hoo Club Lake		1,000
White Rock Club's lake		1,000
Deepwater, Country Club Lake		400
De Kalb, Crump's pond		100
Del Rio, Blane's lake		450
Cienegas Creek, headwaters		450
East Spring Branch		300
Electric Lake		200
Hamilton Pond		150
Henrys Mill Pond		450
Pumping Station Lake		144
San Pedro Creek		450
Slaughter's pond		450
Elkhart, Mineral Wells Lake		500
Emory, Lakewood Lake		50
Floyd, Camp's pond		200
Fort Worth, Crystal Lake		500
Tony Lake		500
Worth Park Lake		500
Giddings, Albers' pond		50
Domaschke's po d		50
Gersh's pond		50
Kappler's pond		50
Kriegel's pond		50
Meissners Lake		50
Schantschick's pond		50
Spring Pond		50
Symm's pond		50
Toepper's pond		80
Volkers' pond		50
Wagner's lake		50
Granger, Lake Fine		675
Greenville, Club Lake		150
Horn Lake		250
Horse Shoe Pond		100
King Lake		500
Reed's lake		100
Groesbeck, Brown's lake		150
Wilson Park Lake		200
Groveton, Rushing's pond		50
Texas—Continued.		
Gunters Switch, Chapman's lake		800
Gunter Lake		1,000
Sportsmen's lake		1,000
Willows Pond		150
Hallsburg, Hallsburg Lake		300
Harwood, Rainwater Lake		100
Hillsboro, Bethel Lake		200
Lakepark Lake		1,000
Holland, Cole's branch		500
Honey Grove, Sanders' Lake		100
West Lake		100
Huntsville, Lake Beulah		200
Smedes Lake		300
Italy, Bell Branch Lake		500
Jefferson, Rowell's lake		500
Jewett, Byrns Lake		100
Kosse, McClellan's pond		50
Langtry, Pump Canyon Pond		30
Laredo, Espey's lake		500
Los Blancos Lake		400
Leesburg, Corn's pond		100
Lewisville, Rector Lake		150
Lindale, Mill Creek Lake		100
Lockhart, Evans' pond		30
Longview, Lake Lomond		130
Lovelady, Long Lake		300
McKenzie's lake		500
Rollo's pond		100
Silver Lake		100
Luftin, Lake Myriad		50
Madisonville, Rogers Lake		500
Manchaca, Onion Creek		250
Mart, Cottonwood Pond		100
McKinney, Burges' Pond		60
Fishing Club lake		1,000
Midfield, Tres Palacios Creek		800
Millett, Held's pond		100
New Braunfels, Comal Creek		700
Paige, Horn's lake		100
Kieschnick's lake		50
Zingler's lake		50
Palestine, Elkhart Lake		500
Halporn's pond		100
Spring Park Lake		500
Wallace's lake		100
Waterworks lake		500
Paris, Clear Lake		300
Goff's lake		100
Lake Lucile		200
Pflugerville, Pfluger Lake		150
Pilot Point, Lake Feeley		400
Pittsburg, Aldridge Pond		180
Rock Wall, Rock Wall Club Lake		500
Sample, Burnett's pond		100
San Angelo, Lake Concho		1,000
San Antonio, Salado Creek		1,568
San Antonio River		1,792
San Marcos, Liveoak Spring		100
Saron, Lake Erie		50
Schulenberg, Wick's pond		150
Seguin, Guadalupe River		1,000
Sprinkle, Barn Fish Pond		50
Sulphur Springs, Beal's pond		100
Bohannon's pond		150
Chaney's pond		100
Elberta Lake		105

DETAILS OF DISTRIBUTION—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Texas—Continued.		
Sulphur Springs, Harrison's pond		100
Myers Lake		50
Tate's pond		100
Thomas' pond		150
Young's pond		100
Talpa, Lake Skiles		100
Laughlin Lake		100
Temple, Lake Polk		800
Terrell, Barksdale's lake		150
Barton's pond		100
Henderson Pond		100
Highpoint Lake		100
Jones Lake		100
Noble's pond		150
Pratt Pond		100
Reynolds Lake		150
Sam Dye Lake		150
Slaton Lake		100
Tom Dailey Pond		100
Weatherford's pond		150
Windom Pond		150
Texarkana, Temple Lake		1,840
Tyler, Greenbrier Lake		500
Scott Park Lake		150
Vonormy, Medina River		1,000
Waco, Flat Creek Pond		500
Halbert's pond		300
Lake Eloise		200
Silver Lake		100
Willow Spring Lake		100
Waller, Binford's pond		200
Ellis' Lake		200
Waxahachie, Bell Branch lake		2,000
Katy Lake		400
Simms Lake		800
Sweeney's pond		250
Whitesboro, Anderson's pond		150
Angling Club lake		550
Wills Point, Dean's pond		50
Fuller's pond		50
Windom, Anglers Lake		100
Winnsboro, Green Pond		50
Hurdle's lake		500
Keystone Lake		150
Lake Erie		300
Railroad Pond		300
Rod and Gun Club Pond		100
Snow's pond		150
Woodbine, Cook's pond		100
Ware's pond		150
Virginia:		
Ashland, Ashland Park Pond		100
Atlee, Tug Bank Lake		100
Big Island, James River		100
Blackstone, Jones' pond		100
Bristow, Broad Run		200
Brookneal, Staunton River		300
Buchannon, James River		100
Buffalo Junction, mill pond		200
Shelton's pond		200
Burkeville, Cary's pond		100
Chatham, Hurt's pond		300
Chester, Goyane's pond		200
Sheild's pond		100
Cleveland, Big Cedar Creek		300
Little Cedar Creek		300
Virginia—Continued.		
Cohoke, Cohoke Pond		100
Columbia, Cowherd's pond		200
Selma Pond		100
Crewe, Spring Pond		100
Danville, Clark's ponds	2,000	
Gilbert's pond	1,000	
Riverside Lake		350
McGuire's pond		100
Shady Pond		300
Spring Pond	1,000	
Springwater Pond		100
Fall Creek, Fall Creek Pond		300
Farmville, Willis River		150
Eagle Mountain, James River		100
East Lexington, North River		2,000
Eggleston, Sinking Creek		300
Elba Station, Lakeside Pond		100
Emporia, Fountain Creek		100
Gladys, Seneca Creek	1,800	
Glenallen, Thomas' pond		100
Graham, Bluestone River		400
Greensprings, Millington Mill Pond		125
Griffiths, Cowpasture River		150
Harrisonburg, Shenandoah River		100
Newlett, Offley Mill Pond		125
Holland, Copeland Mill Pond		100
Hunters, Marsh Creek		100
Laurel, Lawrence's pond		150
Pit Creek Pond		150
Lightfoot, Freestone Pond		100
Louisa, Kent Pond		125
Williams' pond		100
Lynchburg, Oddfellows' Home pond		50
Manchester, Falling Creek Mill Pond		100
Martinsville, Smith River		500
Smith River Pond	3,000	
Mayo, Blue Wing Pond		200
Midlothian, Spring Pond		100
Milford, Coolwater Pond		100
Natural Bridge, James River		100
Newport News, Lake Pearle		100
Norton, Lake Eugenie		1,000
Powell River, tributary		200
Nottoway, Crystal Lake	1,400	
Fitzgerald Mill Pond		100
Nottoway Pond		100
Occoquan, Murumsco Run		100
Occoquan River		100
Pamplin, Horse Pen Mill Run		100
Penola, Campbell's pond		100
Petersburg, Pamplin Lake	900	
Port Norfolk, Cotton's pond		100
Pulaski, Peak Creek		100
Rapidan, Bresee's lake		100
Reusens, James River		100
Rice Depot, Sailor Creek Pond		200
Richmond, Clarendon Lake		200
Gaines Mill Pond		100
Ridge Pond		100
Sevalnis Pond		100
Woodson's mill pond		100
Ringgold, Harrington's pond	1,000	
Rock Castle, Finch's mill pond		100
Rocky Mount, Blackwater River		500

DETAILS OF DISTRIBUTION—Continued.

LARGE-MOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Virginia—Continued.		
Ruther Glen, Pleasant Selts Pond		200
Sharps, Union Mill Pond		100
Snowden, James River		100
Staunton, Middle River		100
Sterling, Potomac River		100
Strasburg Junction, Shenandoah River		300
Sutherland, Dunnivant's pond	900	
Leonard's pond	900	
Tazewell, Maiden Spring		400
Toano, Branch's pond		100
Temple Hall Pond		100
Troutdale, Big Fox Creek	2,000	
Wakefield, Wrenns Mill Pond		200
Walker, Dukes Mill Pond		100
Walkerford, James River		225
Warminster, Swan Creek		100
Williamsburg, Tutters Neck Pond		100
Warburton's mill pond		100
Wingina, Gamkirk Pond		50
Zuni, Darden's pond		100
Washington:		
Newport, Beade Lake		400
Schaerers Lake		200
West Virginia:		
Felton, Tygarts Valley River		500
Keyser, Pattersons Creek		550
Morgan County, Great Cacapon River		750
Newlon, Fork Buckhannon River		400
Parkersburg, Logans Pond		250
Shattucks Pond		250
Romney, South Branch Potomac River		910
Sutton, Elk River		300
Wisconsin:		
Athelstane, Elbow Lake		575
Barron, Manitou Lake		200
Birchwood, Birch and Big Chetac Lakes		450
Chetek, Lake Chetek		200
Colgate, Lake Five		200
Cumberland, Beaver Dam Lake		150
Vermilion Lake		150
Dunbar, Moon Lake		725
Eagle, Eagle Springs Lake		250
Wisconsin—Continued.		
Eagle, Lake Lula		250
Eau Claire, Badger Lake		250
Fond du Lac, Lake de Neveu		400
Iron County, Bass Lake		200
Island Lake		250
Noose Lake		200
La Crosse, Mississippi River		2,050
Lampson, Silver Lake		150
Melvina, Hunt Pond		100
Menomonie, Schmitz's lake		200
Merrillan, Electric Pond		200
Halls Creek		200
Trows Pond		200
Mikana, Balsam Lake		300
North Lake, North Lake		200
Princeton, Cox River		300
Richfield, Evergreen Springs		550
Lillycrab Lake		350
Shell Lake, Shell Lake		150
Sobieski, Bass Lake		200
Solon Springs, St. Croix Lake		150
Sparta, Lower La Crosse River		200
Perch Lake		200
Walworth Pond		200
Sturgeon Bay, Sturgeon Bay		500
Tomahawk, Osago Lake		300
Smith Lake		400
Trevor, Rock Lake		200
Turtle Lake, Horse Shoe Lake		200
Waupaca, Chain of Lakes		200
Wyoming:		
Basin, Rath's pond		150
Casper, reservoir		250
Cheyenne, Lake Minnehaha		250
Clearmont, Republican Reservoir		200
Cody, Newton Reservoir		125
Hulett, Bush Reservoir		200
Lovell, Clear Lake		150
Ranchester, Cooley's pond		150
Sheridan, Dome Lake		300
Patrick's reservoir		250
Vial's pond		150
Upton, Upton Reservoir		300
Verona, Verona Reservoir		300
Wheatland, Icehouse Lake		250
Worland, Big Horn River		250
Total [a]	23,900	588,047

BREAM OR SUNFISH.

Disposition.	Fingerlings, yearlings, and adults.
Alabama:	
Andalusia, Knox Pond	725
Anniston, Cane Creek	200
Choccolocco Creek	400
Ohatchie Creek	400
Attalla, Brown's lake	125
Blocton, Schultz Creek	150
Brantley, Lightwood Pond	200
Brundidge, Whittenton's pond	100
Camden, mill pond	125
Childersburg, Tallahatchie Creek	450
Columbia, Johnson's pond	100
Cordova, Indianhead Reservoir	100
Alabama—Continued.	
Cuba, Branch Pond	100
Dothan, Little Choctawhatchee Creek	200
mill pond	200
Elamville, Renfroe's pond	525
Elba, Hataway's lake	150
Enterprise, mill pond	350
Spring Pond	200
Wilkinson Creek	525
Epes, mill pond	100
Eutaw, Jones Pond	100
Hill's lake	100

[a] Lost in transit, 600 fry and 9,415 fingerlings.

DETAILS OF DISTRIBUTION—Continued.

BREAM OR SUNFISH—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Alabama—Continued.	
Fayette, Bankhead's pond	1,000
Five Points, Avery's pond	175
Fort Mitchell, Ihagee Creek	200
Gadsden, Big Canoe Creek	200
Goshen, Sikes Pond	200
Greensboro, Green Pond	100
Guin, Hell Creek	600
Jacksons Gap, Shepard's pond	125
Livingston, Spratt's lake	150
Marion, Tucker's pond	100
Cherokee County, Alexander's pond	100
Monroe, Daniels Pond	200
Morris, Hughes' pond	100
Mountain Creek, Duck Pond	100
Neenah, McCracken's pond	100
Newberne, Allen's pond	100
Oneonta, Humphrey's pond	100
Ozark, Shady Lake	100
Pell City, Dairy Pond	100
Russellville, Ezzell's lake	150
Seale, Watermelon Creek Pond	200
Selma, Burns Lake	150
Clay's pond	125
Melvin's pond	125
Ward's pond	125
Talladega, Flinn's springs	100
Thorsby, Howard's pond	100
Troy, Watkins Pond	125
Tyler, Minter's pond	100
Tyson, Plantation Pond	100
York, Holman's pond	100
Arizona:	
Yuma, Colorado River	100
Arkansas:	
Gravette, Spavinan Creek Pond	300
Georgia:	
Albany, Kinchapoonee Creek	50
Muckafoonee Creek	50
Muckalee Creek	50
Ralls Lake	50
Atlanta, New Lake	40
Peachtree Park Pond	100
River's lake	150
Spring Pond	100
Tyrol Lake	150
Athens, Morton's pond	100
Augusta, Thomas Creek Pond	50
Box Springs, Lake Samokee	200
Mill Creek	200
Cedartown, Benedict Pond	150
Lake Creek	375
Lidell's lake	125
Punkin Pile Creek	150
Dawson, Ingram Pond	50
Hogansville, Spring Pond	275
Jefferson, Gordon's pond	35
Lawrenceville, Campbell's pond	35
Walls Pond	35
Madison, Brooks Pond	250
Brown's pond	200
Poplar Hill Pond	50
Meansville, Staves Mill Pond	300
Moran, Spring Pond	125
Montezuma, pond and stream	200
Thomas Pond	50
Norwood, Harts Creek	200
Ogeechee River	325
Smith's pond	125
Williams Creek	200
Palmetto, Spring Pond	100
Rabbitt, Juniper Creek	50
Riverdale, Huie's pond	100
Roberts, Hartman's pond	200
Roseland, Lakewood Pond	150
Shellman, Holman's pond	50
Sears Pond	50
Georgia—Continued.	
Shellman, Terry's pond	50
Stone Mountain, Stone Mountain Lake	400
Twedell's pond	50
Summerville, Pennville Mill Pond	125
Talbotton, Jug Factory Branch Pond	50
Thomson, Boyd Pond	50
Tifton, Timmons Pond	50
Trion, Pennoille Lake	150
Winder, Cotton Mills Lake	35
Illinois:	
Alpha, Crescent Lake	100
Altamont, Shroeder's lake	200
Alton, Vierman's pond	250
Belleville, Heinemanns Lake	200
Kaiser Lake	400
Brighton, Andrew's pond	250
North Star Lake	250
Bristol, Barnes Pond	100
Campbell Hill, Mohelenbrook's pond	200
Carbondale, Dillinger Lake	400
Carlinville, Beaverdam Lake	500
C. & A. reservoir	250
The Large Pond	250
Chrisman, Light Pond	250
Collinsville, Winngers Pond	250
Columbia, Columbia Lake	200
Hills' pond	200
Donnellson, Wilson's pond	250
Freeport, Pecatonica River	400
Goodenow, Black Walnut Lake	300
Henderson, Rice Branch	150
Highland, Oak Hill Lake	250
Kell, McLaughlin's pond	200
Lewiston, Hinds Pond	250
Marion, Miller's lake	600
Modesto, Moffett's pond	250
Momence, Kankakee River	200
Moro, Dorsey's pond	200
Mount Olive, Mount Olive Reservoir	500
Mount Vernon, Patton's ponds	400
Naperville, branch of Dupage River	400
Oakland, Annin's pond	250
Odell, Morse's pond	500
Palmyra, Maple Lake	250
Percy, Lightner's lake	200
Rossville, Mann Pond	200
Savanna, Mississippi River	24,000
Shipman, Olmsted's pond	250
Sparta, Crothers Lake	200
Springfield, Camp Lincoln Pond	250
Steelville, Mount Pleasant Pond	150
Strasburg, Latche's pond	250
Wataga, George Pond	400
Waterloo, Bostwick's lake	200
mill pond	200
Waverly, Ford's pond	250
Indiana:	
Anderson, Moss Lake	250
Arlington, gravel pit	100
Aurora, Cheek's pond	100
Brazil, Seegelin's lake	200
Broadripple, Gardener's pond	150
Chandler, Rainwater Pond	175
Cloverdale, Dean's pond	150
Evansville, Stringtown Pond	175
Fairmount, gravel pit	100
Glenwood, Highland Ice Pond	100
Huntington, Oakridge Pond	250
Macy, South Mud Lake	200
Owensville, Lefler's pond	100

DETAILS OF DISTRIBUTION—Continued.

BREAM OR SUNFISH—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Indiana—Continued.	
Parr, Winston lake	100
Russiaville, Grassy Branch Pond	100
West Honey Creek	200
Winchester, Clearwater Pond	200
Iowa:	
Afton, Kelley's pond	100
Bellevue, Mississippi River	24,000
Chester, Beaver Creek	200
Upper Iowa River	300
Clayton, ice pond	200
Mississippi River	15,750
Coggon, Buffalo Creek	300
Des Moines, Sebago Lake	275
Fairfield, Fairfield Lake	1,000
Lansing, Mississippi River	6,000
Manchester, Maquoketa River	3,500
Manilla, Petersen's pond	100
North McGregor, Mississippi River	25,750
Waterloo, Cedar River	300
Kansas:	
Abilene, Acme Lake	155
Collyer, Saline Creek	150
Craig, Mill Creek	100
Ellis, Big Creek	150
Garden City, Peachgrove Pond	100
Holton, Brockelman's pond	100
Junction City, Sevensprings Lake	200
Whiskey Point Lake	150
Kansas City, Lake Byron	150
White's lake	100
Kinsley, Andrews' pond	125
Logan, Spring Pond	100
Marion, Carpenters Creek	100
Olathe, Lake Chanute	250
Peabody, Catlin Creek	125
Doyle Creek	100
Pittsburg, Evo Lake	700
Vliets, Kjellberg's pond	100
Kentucky:	
Adairsville, Girvins Pond	100
Cobb, Meadow Pond	150
Crittenden, Collins Pond	125
Depoy, Spurlin's pond	100
Dixon, Mabery's pond	100
Elliston, Tenmile Creek	250
Eminence, Buttimer's pond	100
Duncan's pond	100
Land's pond	100
Sanford's pond	150
Stone Pond	100
Weggenton's pond	100
Erlanger, Erlanger Fair Lake	100
Farmers, Freestone Pond	400
Franklin, Denning's pond	100
Frankfort, Morris Pond	150
Stewart's pond	150
Glasgow, Jack Spring	100
Slash Pond	100
Smith's pond	100
Greendale, Beaumond's pond	100
Hodgenville, Kirkpatrick's pond	100
La Grange, Osborn's pond	100
Lawrenceburg, Willard Pond	100
Leitchfield, Jones' pond	150
Lexington, Eldermere Pond	100
Estill's pond	150
Prices Pond	100
Mayfield, Henson's pond	100
Smith's pond	100
Midway, Kinkead Pond	150
Milton, Spring Pond	100
Newport, Gray's pond	100
Nicholasville, Hollenden Pond	100
Paris, Bedford Pond	100
Kentucky—Continued.	
Paris, Jacoby's pond	125
Pembroke, Cedar Grove Pond	100
Russellville, Duncan's pond	100
Simpsonville, Clear Pool	100
Smiths Grove, Wade Pond	100
Sparta, Lowdenback's pond	100
Moor's pond	100
Trenton, McQuerry Pond	100
Williamstown, Cherry Hill Pond	100
Lake Obispo	100
Woodburn, Turner Pond	100
Louisiana:	
Coushatta, Mobley's pond	100
Spring Pond	200
Robeline, Jordan Pond	300
Villa Jordan Pond	300
Michigan:	
Bath, Park Lake	100
Lakeland, Zukey Lake	500
Minnesota:	
Brownsville, Mississippi River	3,750
Mississippi:	
Aberdeen, Ware's pond	100
Baldwyn, Gordon Pond	100
Palmer's pond	100
Bassfield, Springbranch Pond	100
Bay St. Louis, Happy Home Pond	200
Belden, Bryant's pond	100
Bolton, Gaddes Pond	150
Powell's lake	100
Williams' pond	100
Booneville, Carter's lake	100
Robertson's lake	100
Brandon, Busick's pond	100
Bovina, Gin Pond	150
Golf's pond	150
Monger Pond	150
Centerville, Anderson's pond	125
Jackson's pond	125
Clinton, The Oaks Lake	100
Corinth, Berry's lake	100
Billswell Lake	80
Duck Hill, Branch Lake	100
Durant, Choctou Pond	100
Eastabuchie, Branch Pond	100
Ecru, Hattox Pond	100
Enterprise, Kamper's pond	100
Vorhes' pond	100
Flora, Greaves' pond	100
Foster, Junkin's pond	200
Sunnyside Pond	100
Gloucester, Cassel's pond	100
Jackson's pond	100
Hamburg, Leahmann's pond	100
Hardy Station, Martin's pond	100
Harriston, Richmond Hill Pond	100
Hazelhurst, Chiles' pond	100
Heidelberg, Campbell's pond	100
Hermanville, Talbot Pond	200
Jackson, Atkinson's pond	125
Farrish Pond	100
Knoxville, Temple's pond	100
Kosciusko, Cain's pond	20
Daniel's pond	20
Lake Cormorant, Mary White Pond	125
Lambert, Lake Clear	125
Lauderdale, Campbell's pond	100
McNair, Brookville Pond	100
Meridian, Beeson's lake	100
Bluff Springs Pond	100
College Fish Pond	100
McArthur's pond	100
Mineral Pond	100
Mountain Spring Lake	100
Wagner's pond	100
Natchez, Bellevue Pond	100

DETAILS OF DISTRIBUTION—Continued.

BREAM OR SUNFISH—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Mississippi—Continued.	
Natchez, Bunker Hill Pond	100
New Albany, Potts' pond	100
Pickens, Tucker's pond	100
Quitman, Beard's pond	100
Lotts Pond	100
Rogers Lake	100
Raymond, Anchorage Pond	100
Rienzi, Dilworth's pond	100
Freestone Pond	150
Lorick's pond	100
Sandersville, Lightsey Pond	150
Sessums, Foster's pond	100
Starkville, Howell's pond	100
Summit, Caruth's pond	100
Taylorville, Mayfield's pond	100
Toomsuba, Shannon's lake	100
Waynesboro, Pou's pond	100
Sigler's pond	100
West Point, cotton mill reservoir	100
Homo Pond	100
Snider's pool	100
Wesson, Mill Pond	100
Wheeler, Putt's lake	100
Springbranch Lake	100
Woodville, McGehee's pond	75
Missouri:	
Belton, Wright Pond	125
Brunswick, Cut-off Lake	100
Columbia, experiment pond	200
Fairview, Shoal Creek Pond	300
Kansas City, Hagerman's pond	100
Russell's pond	100
Macon, Turner's pond	150
Mexico, railroad lake	75
Milan, Dobson's mill pond	200
Orchard Spur, Frisco Orchard Lake	200
Portland, Highland Pond	100
Seligman, Finn's pond	150
Springfield, Pearson's creek	150
Nebraska:	
Orleans, Republican River	300
New Mexico:	
Bayard, irrigation pond	150
Elida, Rick's pond	125
Safford, Swift's lake	200
North Carolina:	
Cerro Gordo, Horse Branch Pond	60
Charlotte, Carson's lake	75
Longcreek Pond	75
Clarkton, Blackwater Pond	60
Russ' pond	60
Wooten Mill Pond	60
Duke, Branch Pond	75
Dunn, Stuart Creek	75
Durham, Aquae Fons Pond	75
Elkins, Holt's pond	50
Fayetteville, Hopemont Pond	75
Flat Rock, King's pond	100
Goldsboro, Ellijay Pond	75
Hendersonville, Case's pond	100
Ewart's pond	150
Tulip Pond	50
Linden, Big Juniper Pond	75
Stewarts Creek Mill Pond	75
Lumberton, Morrissey Mill Pond	75
McCullers, Harris' pond	75
Monroe, Crow Brothers Pond	50
New Hill, tributary Little Whiteoak Creek Pond	75
Norwood, Spring Pond	75
Pine Level, Peedin's pond	75
Pinnacle, Butner's pond	75
Raleigh, Beldin's pond	75
Lake Mishew	150
McGee's pond	75
North Carolina—Continued.	
Raleigh, Milburne Pond	75
O'Kelley's pond	75
Spring Lake	75
Reidsville, Tobacco Co.'s pond	75
Rockwell, Trexler's pond	75
Rural Hall, Grassey Creek Pond	75
Siloam, Doublecreek Spring	50
Wadesboro, Bancom Mill Pond	75
Little Brown Creek Pond	75
North Dakota:	
Bottineau, Lake Metigoshe	75
Devils Lake, Ayers Lake	50
St. John, Grand Lake	50
Ohio:	
Akron, Springfield Lake	250
Coalridge, Opperman's pond	200
Lemoine, Foster's pond	150
New Carlisle, Silver Lake	200
Springfield, Mad River	200
Sycamore, Walton's pond	150
Oklahoma:	
Altus, Lake Wootten	50
Carrier, Berry's pond	50
Cleo, Poplar Hill Pond	74
Crescent, Deffinbaugh Pond	74
Wehr's pond	74
Custer, Shultise's pond	74
Davidson, Campbell's pond	74
Enid, Clouse pond	74
Sand Creek	50
Erick, Maple Grove Lake	73
Hennessey, Henry's pond	74
Hitchcock, Spring Pond	74
Lahoma, Haskins' pond	74
Manchester, Bobbs Pond	100
Manchester Lake	75
Rife's pond	75
Morrow, Fuller's pond	74
Martin's pond	75
O'Keene, Kirchner's pond	74
Pondcreek, Crystal Pond	74
Gentry's pond	74
Pond Creek	75
Sallisaw, Wheeler's pond	400
South Carolina:	
Anderson, Welch's pond	50
Calhoun, Seneca River	100
Campobello, Monk's lake	75
Charleston, Hampton Park Lake	50
Greenville, Gilreath's pond	50
Johnston, Derrick's pond	50
Kershaw, Hinson's ponds	200
Liberty, cotton mill reservoir	50
Manning, White's pond	50
Marion, Bonnie Binori Pond	50
Otranto, Goose Creek Lake	100
Pomaria, Clearwater Pond	100
Seneca, Crawford Pond	50
Lans Branch	50
Stillhouse Branch Pond	50
Sumter, Duck Pond	50
Taylors, Beaverdam Pond	50
Taylors Pond	50
Trenton, Chavis Creek	50
Walhalla, Branch Pond	50
Burns Pond	50
Cane Creek	100
Westville, Still Pond	125
South Dakota:	
Britton, Long Lake	275
Presho, Stevens Lake	450
Tennessee:	
Bluff City, Holston River	300
Chuckey, Limestone Creek	100
Spring Pond	100
Lewisberg, Freestone Pond	150

Details of Distribution—Continued.

BREAM OR SUNFISH—Continued.

Disposition.	Fingerlings, yearlings, and adults.	Disposition.	Fingerlings, yearlings, and adults.
Tennessee—Continued.		Texas—Continued.	
Lewisberg, Gipson's pond	150	Tyler, Spring Pond	150
Silver Creek	150	Whitewright, Binion's pool	50
Louisville, Rogers Pond	100	Wills Point, Curtis' pond	40
Madisonville, Big Pond	100	Perch Pond	40
Jones' pond	100	Virginia:	
Mason, Elcan's pond	100	Danville, Branchwater Pond	100
Herring's pond	100	Leesburg, Tuscarora Creek	100
Petersburg, Cane Creek	150	Milford, ice pond	100
Pocahontas, Lake of Fortune	100	Pemberton, Sanderson's pond	100
Slayden, Mineral Pond	100	Richmond, Forest Hill Park Lake	100
Somerville, Lake Alice	200	Westhampton Park Lake	100
Washburn, Mallicoat's pond	100	Washington:	
Westmoreland, Trammel Pond	100	Roy, Coffel's pond	100
Westport, Phillips' pond	100	Spokane, Horse Shoe Lake	200
Whitwell, Dykes' pond	100	West Virginia:	
Texas:		Fairmont, Highland Pond	200
Denison, Lake Shawnee	400	Wisconsin:	
Water Co.'s reservoir	1,000	Genoa, Mississippi River	6,000
Floresdale, Pleasantview Pond	50	La Crosse, Mississippi River	15,450
Garza, Sanders' pond	100	Prairie du Chien, Mississippi River	8,000
Longview, Elliott's pond	75		
Madisonville, Pattersons Lake	100	Total [a]	202,810
Mart, Christmas Creek Pond	100		
Willow Hole Lake	100		
Palestine, Crystal Lake	200		
Rockdale, Coffield's pond	150		

PIKE PERCH.

Disposition.	Eggs.	Fry.
Connecticut:		
Waterbury, East Mountain Reservoir		400,000
Winsted, Highland Lake		400,000
Delaware:		
Wilmington, Brandywine Creek		100,000
Illinois:		
Barrington, Bangs Lake		300,000
Carbondale, Hundleys Lake		800,000
Dallas City, Mississippi River		1,000,000
Edwardsville, Busse's lake		200,000
Elgin, Fox River		800,000
Freeport, Snyder's pond		500,000
Havana Illinois Fish Commission	25,000,000	
Ingleside, Lowrey's lake		200,000
Libertyville, Morrell's lake		200,000
Meredosia, Meredosia Bay		1,500,000
Quincy, Soldiers' Home Lake		200,000
Springfield, Park Lake		200,000
Waukegan, Third Lake		800,000
Indiana:		
Warsaw, Winona Lake		300,000
Williamsburg, Greensfork Creek		350,000
Wolcottville, Whitmer Lake		350,000
Iowa:		
Mason City, Clear Lake		600,000
Kentucky:		
Ford, Kentucky River		350,000
Irvine, Kentucky River		350,000
Valleyview, Kentucky River		300,000
Massachusetts:		
Charlton Depot, Cranberry Meadow Pond		500,000
Greenfield, Lily Pond		400,000
Pickerel Pond		400,000
Pine Hill Pond		500,000
Round Pond		400,000
Michigan:		
Algonac, St. Clair River		5,000,000
Allen, Duck Lake		1,000,000
Alpena, Thunder Bay		3,000,000
Bay City, Saginaw Bay		13,000,000
Belle Isle Park, Detroit River		10,000,000

[a] Lost in transit, 6,780 fingerlings.

Details of Distribution—Continued.

PIKE PERCH—Continued.

Disposition.	Eggs.	Fry.
Michigan—Continued.		
Detroit, Michigan Fish Commission	43,000,000	
Ironwood, Lake Lavina		600,000
Pine Lake		600,000
Lake Ann, Lake Rosa		1,000,000
Montague, White Lake		2,000,000
Owosso, Hopkins Lake		800,000
St. James, Font Lake		1,000,000
Minnesota:		
Alexandria, Union Lake		210,000
Duluth, Island Lake		560,000
Mentor, Maple Lake		560,000
Pengilly, Swan Lake		350,000
Rochester, branch of Zumbro River		200,000
Smiley, Gull Lake		500,000
St. Peter, Emily Lake		366,000
Lake Jefferson		368,000
Washington Lake		366,000
Missouri:		
St. Joseph, Missouri Fish Commission	5,000,000	
New Hampshire:		
Canobie Lake, Island Pond		500,000
Claremont, Cold Pond		500,000
New Jersey:		
Branchville, Culver Lake		200,000
New York:		
Marcellus, Otisco Lake		800,000
New York City, New York Aquarium	1,000,000	
Portlandville, Lucas Lake		500,000
Sea Breeze, Irondequoit Bay		800,000
Sullivan County, York Lake		500,000
Summitville, Rutgers Pond		388,000
North Dakota:		
Bottineau, Lake Mettigoshe		210,000
Jamestown, Spiritwood Lake		350,000
Lisbon, Horse Shoe Lake		210,000
Palermo, Clear Lake		210,000
St. John, Bonwin Lake		210,000
Ohio:		
Catawba Island, Lake Erie		5,000,000
Isle St. George, Lake Erie		10,000,000
Middle Bass Island, Lake Erie		20,000,000
Fort Clinton, Lake Erie		20,000,000
Put-in Bay, Lake Erie		25,000,000
Pennsylvania:		
Beavertown, Middle Creek		385,000
Bedford, Raystown Branch Juniata River		550,000
Bushkill, Nichercronk Lake		500,000
Cammal, Pine Creek		600,000
Clifton, Bear Lake		550,000
Erie, Pennsylvania Fish Commission	144,725,000	
Hallstead, Susquehanna River		500,000
Hickory, Alleghany River		600,000
Lock Haven, Susquehanna River		550,000
Scranton, Moosic Lake		500,000
Susquehanna, East Lake		500,000
Page Pond		500,000
Susquehanna River		500,000
Susquehanna County Quaker Lake		500,000
Wrightsville, Susquehanna River		200,000
York Haven, Conewago Creek		200,000
Susquehanna River		200,000
South Dakota:		
Big Stone, Big Stone Lake		400,000
Lake Andes, Lake Andes		1,000,000
Watertown, Lake Kampeska		600,000
Vermont:		
Brandon, Lake Hartonia		500,000
Concord, Hall's pond		500,000
Fairfield, Black Creek		500,000
Hardwick, Lake Greenwood		500,000
Plainfield, Sabin Pond		500,000
Rutland, East Pittsford Pond		200,000
Sheldon Junction, Franklin Pond		500,000
Swanton, Lake Champlain		795,000
Missisquoi Bay		8,000,000
Missisquoi River		22,000,000
West Branch		3,000,000
Vergennes, Lake Champlain		1,000,000
Wells River, Ticklenaked Pond		200,000
Wilmington, Ray Pond		200,000

Details of Distribution—Continued.

PIKE PERCH—Continued.

Disposition.	Eggs.	Fry.
Virginia:		
Mount Jackson, Mill Creek		250,000
West Virginia:		
Philippi, Buckhannon River		250,000
Tygarts Valley River		250,000
Wisconsin:		
Birchwood, Elizabeth Lake		210,000
Matson Lake		210,000
Brillion, Long Lake		400,000
Cameron, Prairie Lake		400,000
Grand View, Southwest Lake		400,000
Grantsburg, Bluff Lake		200,000
Iron River, Eagle Lake		400,000
Upper Pike Lake		400,000
Lampson, Twin Lakes		480,000
Lublin, Diamond Lake		400,000
Narrows, Cedar Lake		560,000
Rice Lake, Rice Lake		400,000
Solon Springs, St. Croix Lake		640,000
Turtle Lake, Echo Lake		400,000
Total [a]	218,725,000	193,438,000

YELLOW PERCH.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Alabama:			
Letohatchie, Rogers Lake			300
Arkansas:			
Stamps, Bodcaw Pond			100
Connecticut:			
Berlin, Harts Reservoir		500,000	
Norwalk, Davis Pond		300,000	
Nashes Mill Pond		300,000	
Norwalk Reservoir		400,000	
South Norwalk Reservoir		500,000	
Winnipauk Mill Pond		300,000	
West Haven, Bronson Brook		300,000	
Windsor Locks, Connecticut Fish Commission		3,500,000	
Delaware:			
Wilmington, Brandywine Creek		2,000,000	
District of Columbia:			
Twining City, Anacostia River		100,000	
Georgia:			
Stone Mountain, Venable Lake			300
Illinois:			
Alhambra, Bleisch's lake			200
Carbondale, Thompson's lake			100
Decatur, Boiling Spring Lake			250
Knoxville, Eckdahl's pond			250
Murpheysboro, Carbon Lake			150
Richland, Lake Otten			375
Savanna, Mississippi River			10,000
Shipman, Kahl's pond			150
Olmsted's pond			150
Indiana:			
Alexandria, gravel pond			250
Farmersburg, Lash's pond			200
La Grange, Royer Lake			200
Milton, Greens Fork Creek			300
Martindale Creek			300
Nolands Fork Creek			300
Simons Creek			300
West Fork Whitewater River			300
New Haven, Chauss's pond			200
Russiaville, East Honey Creek			200
Silver Lake, North Silver Lake			350
Iowa:			
Anamosa, Buffalo River			500
Bellevue, Mississippi River			10,000
Clayton, Mississippi River			8,700

[a] Lost in transit, 177,000 fry.

DETAILS OF DISTRIBUTION—Continued.

YELLOW PERCH—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Iowa—Continued.			
Fairfield, Fairfield Lake			1,000
Lansing, Mississippi River			2,500
Manchester, Maquoketa River			2,000
North McGregor, Mississippi River			12,100
Kansas:			
Garnett, Hazeldell Lake			100
Langdon, Catte's pond			220
Ossawatomie, State Hospital Pond			100
Kentucky:			
Goldsdale, Lake Wolking			250
Trenton Dickinson's pond			300
Maryland:			
Baltimore, Benkerts Lake		300,000	
Foremans Lake		200,000	
Maryland Fish Commission	2,080,000		
Accokeek Creek, at mouth, Potomac River		45,996,000	
Berwyn, Spring Pond		100,000	
Broad Creek, at mouth, Potomac River		3,500,000	
Bush River, Bush River		60,000,000	
Cecil County, Furnace Creek		19,291,000	
Northeast River		60,000,000	
Harford County, Swan Creek		89,600,000	
Pamunkey Creek, at mouth, Potomac River		1,800,000	
Piscataway Creek, at mouth, Potomac River		20,310,000	
Swan Creek, at mouth, Potomac River		2,495,000	
Massachusetts:			
North Grafton, Hovey Pond		500,000	
Michigan:			
Hopkins, Ellinger Lake			300
Manitou Beach, Devils Lake			400
Minnesota:			
Brownsville, Mississippi River			1,250
Rochester, branch of Zumbro River			500
Mississippi:			
Mahned, Mill Creek			250
Missouri:			
Columbia, experimental pond			25
Mexico, Grosland Lake			150
railroad lake			200
Waterworks Pond			200
Montana:			
Butte, Columbia Garden rearing pond			125
Nebraska:			
Lodgepole, Oberfelder's lake			250
New Hampshire:			
Littleton, Streeter Pond		1,000,000	
New Mexico:			
Santa Rosa, Agua Negro, Chiquite Creek			175
Grand Lake			125
Santa Rosa Lake			125
New York:			
Middletown, Wallkill River		500,000	
Monroe, Monbasha Lake		500,000	
Round Island Lake		500,000	
Walton Lake		500,000	
New Paltz, Wallkill River		500,000	
Otisville, Dromgoole's pond		100,000	
North Carolina:			
Stoval, Gregory's pond			500
North Dakota:			
Oakes, Olthoff's pond			200
Ohio:			
Leavitsburg, Mahoning River			300
Oklahoma:			
Oklahoma City, Lakeview Club Lake			300
Perry, Cummings Pond			150
Pennsylvania:			
Ashland, Deep Creek		98,000	
Keller's pond		98,000	
Taylorsville Run		98,000	
Boyertown, Manatawney Creek		500,000	
Swamps Creek		500,000	
Centerbridge, Rodgers Pond		100,000	
Eaglesmere, Eaglesmere Lake		100,000	
Lake Lewis		100,000	
Glenlock, Hersheys Dam		200,000	
Hosensack, Hosensack Dam		400,000	

Details of Distribution—Continued.

YELLOW PERCH—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Lake Ariel, Lacawac Pond		100,000	
New Oxford, Little Conawago Creek		800,000	
Noble, Herring's pond		200,000	
Reading, Angelica Lake		500,000	
Gouglersville Dam		500,000	
South Dakota:			
Bruce, Oakwood Lake			400
Loyalton, Artesian Lake			200
Madison, Lake Madison			200
Tennessee:			
Bluff City, Holston River			1,000
Columbia, Snow Pond			50
Erwin, North Indian Creek			275
Jefferson City, Field Pond			400
Vermont:			
St. Johnsbury, Passumpsic River		3,750,000	
Swanton, Missisquoi River		2,000,000	
Virginia:			
Dogue Creek, at mouth, Potomac River		20,865,000	
Harrisonburg, Silver Lake		500,000	
Little Hunting Creek, at mouth, Potomac River		18,860,000	
Mount Jackson, Mill Creek		500,000	
Pohick Creek, at mouth, Potomac River		15,415,000	
Quicksburg, Kelley's pond			100
West Virginia:			
Inwood, Back Creek		500,000	
Wisconsin:			
Genoa, Mississippi River			2,500
LaCrosse, Mississippi River			1,400
Prairie du Chien, Mississippi River			3,000
Total [a]	2,080,000	382,576,000	68,045

STRIPED BASS.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
California:			
Bouldin Island, San Joaquin River		1,272,500	
North Carolina:			
Weldon, Roanoke River		3,061,000	
Total		4,333,500	

WHITE PERCH.

Disposition.	Eggs.	Fry.
Connecticut:		
Norwalk, Davis Mill Pond		560,000
Reservoir		560,000
Delaware:		
Wilmington, Brandywine Creek		2,800,000
District of Columbia:		
Twining City, Anacostia River		3,200,000
Washington, basin of Potomac River		650,000
Maine:		
Monmouth, Maine Fish Commission	700,000	
Maryland:		
Battery Haul, Chesapeake Bay		119,655,000
Bush River, Bush River		5,880,000
Cecil County, Elk River		84,000,000
Centerville, Reeds Creek		560,000
Lapidum, Susquehanna River		35,658,000
Western Flats, Chesapeake Bay		57,927,000
Massachusetts:		
East Pepperell, Massapogh Pond		700,000
Falmouth, Jenkins Pond		560,000
Mares Pond		560,000
Fitchburg, Whalom Lake		1,400,000
North Brookfield, Lake Lashaway		700,000

[a] Lost in transit, 6,000 fry and 1,080 fingerlings.

Details of Distribution—Continued.

WHITE PERCH—Continued.

Disposition.	Eggs.	Fry.
New Hampshire:		
Ashuelot, North Round Pond		420,000
Claremont, Crescent Lake		700,000
Hinsdale, Kilburn Pond		700,000
Round Pond		420,000
Spofford Lake		840,000
Littleton, Partridge Lake		700,000
Whitefield, Forest Lake		700,000
New Jersey:		
Belle Plain, Wittenberg's pond		700,000
Boonton, Capstuk Lake		560,000
New York:		
New York City, New York Aquarium	5,040,000	
Rhode Island:		
Glendale, Herring Pond		560,000
Total	5,740,000	321,670,000

WHITE BASS.

Disposition.	Fingerlings, yearlings, and adults.
Minnesota:	
Brownsville, Mississippi River	500

FRESHWATER DRUM.

Illinois:	
Savanna, Mississippi River	12,500
Iowa:	
Bellevue, Mississippi River	12,500
Clayton, Mississippi River	500
North McGregor, Mississippi River	700
Total	26,000

COD.

Disposition.	Eggs.	Fry.
Maine:		
Ashdale, Casco Bay		3,863,000
Boothbay Harbor, Boothbay Harbor		9,433,000
Linekin Bay		3,559,000
Bristol, Johns Bay		1,137,000
Cape Elizabeth, Casco Bay		10,578,000
Portland, Casco Bay		3,151,000
Southport, Atlantic Ocean		6,289,000
Boothbay Harbor		1,688,000
Ebencook Harbor		2,554,000
Massachusetts:		
Beverly, Atlantic Ocean		5,660,000
Massachusetts Bay		9,380,000
Gloucester, Atlantic Ocean		27,566,000
Gosnold, Buzzards Bay		15,749,000
Vineyard Sound		89,766,000
Manchester, Atlantic Ocean		1,925,000
Massachusetts Bay		4,280,000
Marblehead, Atlantic Ocean		5,140,000
Rockport, Atlantic Ocean		15,169,000
Ipswich Bay		4,875,000
Waquoit, Waquoit Bay		784,000
Woods Hole, Great Harbor		4,826,000
Vineyard Sound		7,993,000
Argentina:		
Buenos Aires, Argentine Government	3,000,000	
Total	3,000,000	235,365,000

DETAILS OF DISTRIBUTION—Continued.

FLATFISH.

Disposition.	Fry.
Massachusetts:	
Beverly, Massachusetts Bay	4,720,000
Falmouth, Waquoit Bay	32,372,000
Gloucester, Gloucester Harbor	97,749,000
Ipswich Bay	17,856,000
Massachusetts Bay	14,520,000
Gosnold, Buzzards Bay	1,366,000
Hadley Harbor	27,114,000
Lackeys Bay	14,572,000
Tarpaulin Cove	3,776,000
Lanesville, Ipswich Bay	3,976,000
Manchester, Massachusetts Bay	51,905,000
Rockport, Atlantic Ocean	14,500,000
Salem, Massachusetts Bay	4,130,000
Waquoit, Waquoit Bay	7,708,000
Wareham, Wareham River	12,325,000
Woods Hole, Eel Pond	4,800,000
Great Harbor	57,250,000
Rhode Island:	
East Greenwich, East Greenwich Harbor	19,003,000
Total	389,642,000

POLLOCK.

Massachusetts:	
Beverly, Atlantic Ocean	12,375,000
Gloucester, Atlantic Ocean	30,488,000
Manchester, Atlantic Ocean	10,723,000
Marblehead, Atlantic Ocean	3,948,000
Rockport, Atlantic Ocean	8,920,000
Total	66,454,000

TAUTOG.

Massachusetts:	
Woods Hole, Woods Hole Harbor	794,000

LOBSTER.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Maine:		
Bass Harbor, Blue Hill Bay	2,000,000	
Biddeford, Atlantic Ocean	2,000,000	
Gulf of Maine	1,000,000	
Blue Hill, Blue Hill Bay	350,000	
Boothbay Harbor, Boothbay Harbor	12,500,000	
Linekin Bay	3,500,000	
Townsend Gut	2,500,000	
Bristol, Johns Bay	5,500,000	
Muscongus Sound	2,500,000	
New Harbor	3,500,000	
Camden, Penobscot Bay	300,000	
Cape Porpoise, Cape Porpoise Harbor	1,000,000	
Gulf of Maine	5,000,000	
Skipper Joe Harbor	500,000	
Cranberry Isle, Cranberry Isle Harbor	1,000,000	
Cushing, Pleasant Point Gut	1,000,000	
Cutler Harbor, Gulf of Maine	1,000,000	
Deer Isle, Deer Isle Channel	2,000,000	
Duck Island, Gulf of Maine	3,000,000	
Eastport, Gulf of Maine	4,000,000	
Eggemoggin, Penobscot Bay	150,000	
Friendship, Delanos Cove	2,000,000	
Friendship Harbor	7,500,000	
Muscongus Sound	2,500,000	

DETAILS OF DISTRIBUTION—Continued.

LOBSTER—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Maine—Continued.		
Georgetown, Five Island Harbor	1,000,000	
Hermans Harbor	500,000	
Granite, Gulf of Maine	200,000	
Hancock, Skillings River	7,000,000	
Harpswell, Harpswell Sound	2,500,000	
Lowells Cove	2,000,000	
Haycock Harbor, Gulf of Maine	1,000,000	
Isle au Haut, Gulf of Maine	500,000	
Isleboro, Penobscot Bay	2,000,000	
Kennebunkport, Gulf of Maine	3,000,000	
Kittery Point, Atlantic Ocean	3,500,000	
Kittery Harbor	2,000,000	
Piscataqua River	2,000,000	
Spruce Creek	500,000	
Little Deer Island, East Penobscot Bay	1,000,000	
Penobscot Bay	1,000,000	
Matinicus, Gulf of Maine	1,000,000	
Matinicus Bay	2,000,000	
Mount Desert, Bass Harbor	2,000,000	
North Edgecomb, Sheepscot River	5,500,000	
Portland, Chandlers Bay	2,000,000	
Portland Harbor	2,500,000	
Prospect Harbor, Prospect Harbor	3,000,000	
Rockland, Rockland Harbor	2,000,000	
Southport, Ebencook Harbor	7,000,000	
Townsend Gut	1,500,000	
St. George, Matinicus Harbor	2,000,000	
Vinal Haven, Carvers Harbor	2,000,000	
Wells, Wells Beach	500,000	
Wood Island Harbor, Gulf of Maine	3,000,000	
York, York Harbor	500,000	
York River	2,000,000	
Massachusetts:		
Beverly, Atlantic Ocean	240,000	
Massachusetts Bay	450,000	
Boston, Boston Harbor	5,713,000	
Cohasset, Massachusetts Bay	2,786,000	
Cuttyhunk Harbor, Buzzards Bay	848,000	
Dartmouth, Buzzards Bay	518,000	
Falmouth, Buzzards Bay	1,401,000	
Gloucester, Atlantic Ocean	2,595,000	
Ipswich Bay	480,000	
Gosnold, Buzzards Bay	2,150,000	
Hadley Harbor, Buzzards Bay	4,101,000	
Manchester, Atlantic Ocean	1,070,000	
Massachusetts Bay	1,050,000	
Marblehead, Atlantic Ocean	300,000	
Marthas Vineyard, Menemsha Bight	789,000	
Nahant, Atlantic Ocean	600,000	
Massachusetts Bay	500,000	
North Tisbury, Vineyard Sound	469,000	
Quissett, Buzzards Bay	1,589,000	
Rockport, Atlantic Ocean	2,450,000	
Loblolly Cove	360,000	
Rockport Harbor	450,000	
Salem, Atlantic Ocean	1,500,000	
Massachusetts Bay	1,000,000	
Scituate, Massachusetts Bay	800,000	
Swampscott, Atlantic Ocean	700,000	
Wellfleet, Massachusetts Fish Commission	1,475,000	
Westport, Buzzards Bay	3,453,000	
Woods Hole, Buzzards Bay	1,354,000	
Woods Hole Harbor	3,241,000	
New Hampshire:		
Hampton, Atlantic Ocean	1,500,000	
Rye, Atlantic Ocean	500,000	
Washington:		
Decatur, Puget Sound		153
Friday Harbor, Puget Sound		609
Lopez, Puget Sound		143
Port Stanley, Puget Sound		106
Total	180,932,000	1,011

O

THE FISHERIES OF ALASKA IN 1908

BY MILLARD C. MARSH

Agent at the Salmon Fisheries of Alaska

and

JOHN N. COBB

Assistant Agent

Bureau of Fisheries Document No. 645

CONTENTS.

THE FISHERIES OF ALASKA IN 1908.

By Millard C. Marsh, *Agent at the Salmon Fisheries of Alaska,*
and
John N. Cobb, *Assistant Agent.*

SUMMARIZED STATISTICS.

As in the reports for previous years, the District of Alaska is considered in the four geographic sections generally recognized, as follows: Southeast Alaska, embracing all that narrow strip of mainland, and the numerous islands adjacent, from Portland Canal northwestward to and including Yakutat Bay; central Alaska, the region on the Pacific, or south side, from Yakutat Bay westward, including the Aleutian chain; western Alaska, the shores of Bering Sea, and islands in this sea; and arctic Alaska, from Bering Strait to the Canadian border.

With the exception of arctic Alaska and a portion of western Alaska, practically all of the fishing localities were visited by one or the other of the agents. Statistics of the yield of fur seals from the Pribilof Islands were obtained through the courtesy of the agent at the fur seal islands, while figures for the other aquatic furs (except the coast fur seals and sea otter) and skins, also the whalebone and walrus ivory, were obtained from the custom-house records at Juneau. Considerable commercial fishing is carried on in the Yukon River and its tributaries, where fish wheels, nets, and spears are employed, but unfortunately it has been found impossible so far, owing to the short time available each season and the few agents employed, to extend the inspection work over this large region, or to secure data showing the extent of the fisheries there.

As in previous years, by far the greater part of the fishery products of Alaska are marketed outside the district, but a steadily increasing local demand is noticeable, especially in the case of the hitherto somewhat neglected minor species.

PERSONS ENGAGED.

The number of persons engaged in the fisheries of Alaska in 1908 was 13,337, of whom 4,976 were engaged directly in fishing, 7,740 in the canneries, salteries, and at other shore work, and 621 employed on the transporting vessels. This total is a gain of 585 over the num-

ber employed in 1907. The fact that the fishermen act as sailors on the transporting ships to and from the salmon canneries and salteries explains the small number of transporters shown in the table. Owing to the impossibility of the agents' visiting arctic Alaska in the limited open season, thus making it difficult to secure accurate data, no attempt has been made to show the number of men employed and the investment in the fisheries of this region, although certain of the products are shown in the proper table.

PERSONS ENGAGED IN THE ALASKA FISHERIES IN 1908.

Occupation and race.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites	1,193	663	1,554	3,410
Indians	1,298	103	138	1,539
Japanese	27			27
Total	2,518	766	1,692	4,976
Shoresmen:				
Whites	519	307	1,003	1,829
Indians	886	165	430	1,481
Chinese	765	393	860	2,018
Japanese	435	374	1,603	2,412
Total	2,605	1,239	3,896	7,740
Transporters:				
Whites	263	144	165	572
Indians	40	2	7	49
Total	303	146	172	621
Grand total	5,426	2,151	5,760	13,337

INVESTMENT.

The total investment in the fisheries was $10,319,784, an increase of $1,103,756 over 1907. The item of cash capital was eliminated in the 1906 report, and this procedure has been followed ever since.

INVESTMENT IN THE ALASKA FISHERIES IN 1908.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Fishing vessels:								
Steamers and launches	30	$171,815					30	$171,815
Tonnage	475						475	
Sailing	15	13,800	2	$3,800			17	17,600
Tonnage	176		61				237	
Transporting vessels:								
Steamers and launches	87	412,300	27	239,100	46	$710,450	160	1,361,850
Tonnage	1,808		1,302		3,312		6,422	
Sailing	8	159,900	13	326,300	28	629,400	49	1,115,600
Tonnage	7,385		13,310		36,360		57,055	
Boats	1,205	165,134	710	88,560	941	303,317	2,856	557,011
Apparatus, vessel fisheries:								
Purse seines	4	2,800					[a] 4	2,800
Haul seines	1	310					[b] 1	310
Lines		7,905						7,905
Guns			30	360			30	360
Gun and Harpoons		275						275

[a] Aggregate length of 2,400 yards. [b] Aggregate length of 300 yards.

INVESTMENT IN THE ALASKA FISHERIES IN 1908—Continued.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Apparatus, shore fisheries:								
Haul seines	82	$21,301	44	$18,115			a 126	$39,416
Purse seines	126	39,464	28	7,150			b 154	46,614
Gill nets	187	23,690	42	3,300	914	$75,835	c 143	102,825
Dip nets	18	14	14	7			32	21
Traps, stake	50	133,900	21	30,850	14	16,325	85	181,075
Traps, floating	15	20,100	1	1,500			16	21,600
Wheels	1	1,000					1	1,000
Crab pots	6	9					6	9
Spears	10	7					10	7
Lines		5,848		2,870				8,718
Hoes	12	9	5	3			17	12
Shore and accessory property		2,560,547		1,280,341		2,842,073		6,682,961
Total		3,740,128		2,002,256		4,577,400		10,319,784

a Aggregate length of 60,452 yards. b Aggregate length of 66,150 yards.
c Aggregate length of 265,056 yards.

PRODUCTS.

The total quantity of products was 217,813,415 pounds, valued at $11,847,443, a gain of 39,455,114 pounds and $1,687,260 over 1907. Except for fertilizer, oil, furs, and hides, the weights are round weights, or the weight of products when first taken from the water; the prepared products weights are shown in the subsidiary tables of the report. Flounders, pollock, rock cod, whitefish, whale meat, and seaweed appear in the table for the first time this year. Whalebone and walrus ivory are the only products reported from arctic Alaska. As has been stated, it was found an impossibility to secure even approximate data as to the persons engaged or the investment in the hunting of aquatic animals (except sea otter and fur seals), which is general among the natives.

PRODUCTS OF ALASKA FISHERIES IN 1908.

Products.	Southeast Alaska.		Central Alaska.		Western Alaska.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Black cod:						
Fresh	21,082	$840				
Salted	20,250	489				
Cod:						
Fresh	12,000	600				
Salted	10,667	225	5,358,399	$131,953		
Smoked			200	7		
Tongues, salted	300	28	21,800	1,962		
Eulachon:						
Fresh	2,820	113				
Salted	27,000	700				
Smoked	200	10				
Flounders, or sole	7,500	225				
Halibut:						
Fresh	4,559,427	144,419	30,000	1,200		
Frozen	958,360	25,194				
Fletched	144,219	4,929				
Herring:						
Fresh	753,750	5,020	10,000	300		
Salted	1,311,200	17,650	22,400	680		
Pollock			2,700	108		

PRODUCTS OF ALASKA FISHERIES IN 1908—Continued.

Products.	Southeast Alaska.		Central Alaska.		Western Alaska.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Redfish or black bass:						
Fresh	11,400	$570	6,500	$325		
Frozen	7,650	230				
Rock cod:						
Fresh	17,500	875	12,000	480		
Frozen	600	36				
Salmon:						
Fresh—						
Coho, or silver	18,000	180	5,000	150		
Humpback, or pink	8,000	60				
King, or spring	798,289	46,858				
Red, or sockeye	42,500	340	16,000	480		
Frozen—						
Coho, or silver	33,887	813				
Dog, or chum	110,737	1,063				
King, or spring	5,245	126				
Red, or sockeye	19,345	564				
Canned—						
Coho, or silver	3,420,093	194,213	808,010	46,172	589,820	$33,704
Dog, or chum	12,614,280	452,678			2,681,630	101,519
Humpback, or pink	41,484,660	1,589,412	2,146,270	85,673	1,458,380	58,294
King, or spring	174,265	10,356	449,120	27,040	1,037,680	62,471
Red, or sockeye	13,122,025	874,475	26,397,490	1,720,857	76,104,770	4,928,919
Mild-cured—						
King, or spring	1,290,300	62,451	299,400	15,360		
Pickled—						
Coho, or silver	159,840	4,898	27,000	750		
Dog, or chum	32,940	707				
Humpback, or pink	608,310	17,191			25,110	744
King, or spring			1,620	480	162,000	6,333
Red, or sockeye	38,880	1,389	653,400	19,480	7,547,310	241,405
Dry-salted—						
Dog, or chum	27,733	416				
Red, or sockeye			28,500	285		
Smoked—						
Coho, or silver			12,000	1,000		
Dog, or chum	100	12				
Red, or sockeye			36,000	3,000		
Salmon bellies, salted:						
Coho, or silver	36,100	380	181,450	3,155		
Dog, or chum	111,150	699				
Humpback, or pink	2,260,325	27,660	38,000	480		
King, or spring					45,600	720
Red, or sockeye	33,250	386	1,691,000	24,770	60,000	1,080
Salmon eggs	15	3				
Smelt	1,504	66				
Trout:						
Dolly Varden—						
Fresh	39,200	1,340	13,000	650		
Frozen	8,000	180				
Rainbow	8,000	480				
Steelhead—						
Fresh	2,900	116				
Frozen	30,681	982				
Whitefish	50	3				
Fertilizer:						
Herring	1,496,000	24,000				
Salmon	374,000	6,000				
Whale	1,066,400	16,126				
Oil:						
Herring	819,000	21,600				
Salmon	204,750	5,400				
Whale	1,232,850	49,036				
Clams	6,000	300	2,000	50		
Crabs	9,000	475	17,400	2,300		
Aquatic furs and skins:						
Beaver	743	3,730	252	1,332	285	1,399
Muskrat	67	119	253	300	3,644	5,838
Otter—						
Land	1,495	5,411	1,637	5,982	200	667
Sea			145	6,300	15	750
Seal—						
Fur	1,992	8,350	804	2,680	89,784	448,920
Hair	4,620	945			14,796	2,405
Walrus ivory	3	3				
Whale meat (tails), salted	1,000	35				
Whalebone	10,209	2,259				
Seaweed	810	203				
Total	89,635,468	3,636,642	38,289,750	2,105,741	89,821,024	5,895,168

PRODUCTS OF ALASKA FISHERIES IN 1908—Continued.

Products.	Arctic Alaska.		Total.	
	Pounds.	Value.	Pounds.	Value.
Black cod:				
Fresh			21,082	$840
Salted			20,250	489
Cod:				
Fresh			12,000	600
Salted			5,369,066	132,178
Smoked			200	7
Tongues, salted			22,100	1,990
Eulachon:				
Fresh			2,820	113
Salted			27,000	700
Smoked			200	10
Flounders, or sole			7,500	225
Halibut:				
Fresh			4,589,427	145,619
Frozen			958,360	25,194
Fletched			144,219	4,929
Herring:				
Fresh			763,750	5,320
Salted			1,333,600	18,330
Pollock			2,700	108
Redfish or black bass:				
Fresh			17,900	895
Frozen			7,650	230
Rock cod:				
Fresh			29,500	1,355
Frozen			600	36
Salmon:				
Fresh—				
Coho, or silver			23,000	330
Humpback, or pink			8,000	60
King, or spring			798,289	46,858
Red, or sockeye			58,500	820
Frozen—				
Coho, or silver			33,887	813
Dog, or chum			110,737	1,063
King, or spring			5,245	126
Red, or sockeye			19,345	564
Canned—				
Coho, or silver			4,817,923	274,089
Dog, or chum			15,295,910	554,197
Humpback, or pink			45,089,310	1,733,379
King, or spring			1,661,065	99,867
Red, or sockeye			115,624,285	7,524,251
Mild-cured—				
King, or spring			1,589,700	77,811
Pickled—				
Coho, or silver			186,840	5,648
Dog, or chum			32,940	707
Humpback, or pink			633,420	17,935
King, or spring			163,620	6,813
Red, or sockeye			8,239,590	262,274
Dry-salted—				
Dog, or chum			27,733	416
Red, or sockeye			28,500	285
Smoked—				
Coho, or silver			12,000	1,000
Dog, or chum			100	12
Red, or sockeye			36,000	3,000
Salmon bellies, salted:				
Coho, or silver			217,550	3,535
Dog, or chum			111,150	699
Humpback, or pink			2,298,325	28,140
King, or spring			45,600	720
Red, or sockeye			1,784,250	26,236
Salmon eggs			15	3
Smelt			1,504	66
Trout:				
Dolly Varden—				
Fresh			52,200	1,990
Frozen			8,000	180
Rainbow			8,000	480
Steelhead—				
Fresh			2,900	116
Frozen			30,681	982
Whitefish			50	3
Fertilizer:				
Herring			1,496,000	24,000
Salmon			374,000	6,000
Whale			1,066,400	16,126

PRODUCTS OF ALASKA FISHERIES IN 1908—Continued.

Products.	Arctic Alaska.		Total.	
	Pounds.	Value.	Pounds.	Value.
Oil:				
Herring			a 819,000	$21,600
Salmon			b 204,750	5,400
Whale			c 1,232,850	49,036
Clams			d 8,000	350
Crabs			e 26,400	2,775
Aquatic furs and skins:				
Beaver			f 1,280	6,461
Muskrat			g 3,964	6,257
Otter—				
Land			h 3,332	12,060
Sea			i 160	7,050
Seal—				
Fur			j 92,580	459,950
Hair			k 19,416	3,350
Walrus ivory	13,742	$9,390	13,745	9,393
Whale meat (tails), salted			1,000	35
Whalebone	53,431	200,502	63,640	202,761
Seaweed			810	203
Total	67,173	209,892	217,813,415	11,847,443

a Represents 109,200 gallons.
b Represents 27,300 gallons.
c Represents 164,380 gallons.
d Represents 850 bushels.
e Represents 8,800 crabs.
f Represents 1,280 skins.
g Represents 31,712 skins.
h Represents 1,333 skins.
i Represents 32 skins.
j Represents 15,430 skins.
k Represents 6,472 skins.

THE SALMON INDUSTRY.

As a whole the season of 1908 was the best ever known in the Alaska salmon industry. There were, however, marked fluctuations in the various regions as compared with previous years.

In central Alaska the season was fair, but not so good as in 1907, the catch of red salmon falling off from 6,637,860 fish in 1907 to 5,507,615 fish in 1908. The run in the Chignik was excellent, as usual, but the Karluk run was later in arriving and smaller in quantity than in 1907. The runs in Prince William Sound and Cook Inlet were fair in size.

In western Alaska, with the exception of the Ugashik River, the Bristol Bay region had a very large run of red salmon, especially in Nushagak Bay and the Kvichak and Naknek rivers. From these rivers fish were transferred to canneries on Nushagak Bay and to Ugaguk and Ugashik; 2,597 king salmon and 132,286 red salmon were lost in transit between the Kvichak River and Nushagak Bay and 86,070 red salmon were lost in transit from the Kvichak River to Koggiung. On the Naknek one cannery's boats were on limit for twenty days continuously, the limit remaining until the close of fishing. Fishing boats often procured their maximum in two hours' fishing.

The cannery of the Alaska Packers' Association at Coffee Creek, burned in 1906, was in process of rebuilding during 1908 and will be ready for operation in the season of 1909. Machinery will be installed

from one of the company's canneries at Ugashik. Four traps were operated in Kvichak River and Bay, two by the Alaska Packers Association and two by the North Alaska Salmon Company.

The salting plant of the Northwestern Packing Company, on Kvichak Bay, was sold to and operated by Nelson, Olsen & Co. The Lagoon Salmon Company operated at Nelsons Lagoon and Mr. Peter M. Nelson on the Igushik River.

In southeast Alaska the run of red salmon was small, but in certain sections this was more than made up by a large run of humpbacks. This year the cannery men in the vicinity of Ketchikan, in order to prevent an expensive fight for red salmon, the species most sought after, met and agreed to so divide up these fish that each plant would get a quantity proportioned to its total outfit. By agreement of the fishermen operating in Boca da Quadra, this year no fishing was allowed inside of a line drawn from the old saltery, just outside the mouth of Quadra Stream, across to the opposite headland. This was done to protect the stream run of red salmon, the old hatchery at the head of Quadra Lake having been reopened.

PLANTS IN OPERATION.

Following is a list of the plants operated in Alaska during the season of 1908:

Name.	Location.
Southeast Alaska:	
Canneries—	
Alaska Packers Association	Loring, Wrangell, and Pyramid Harbor.
Northwestern Fisheries Co	Quadra, Hunter Bay, Santa Ana, and Dundas Bay.
Astoria and Puget Sound Packing Co	Excursion Inlet.
William Duncan	Metlakahtla.
Fidalgo Island Packing Co	Ketchikan.
C. A. Burckhardt & Co	Yes Bay.
Gorman & Co. (Incorporated)	Kasaan Bay.
F. C. Barnes	Lake Bay.
Shakan Salmon Co	Shakan.
North Pacific Trading and Packing Co	Klawak.
Pillar Bay Packing Co	Pillar Bay.
Pacific Coast and Norway Packing Co	Petersburg.
John L. Carlson	Taku Harbor.
George T. Myers & Co	Sitkoh Bay.
Thlinket Packing Co	Funter Bay.
Pacific-American Fisheries	Excursion Inlet.
Columbia Canning Co	Haines.
Yakutat and Southern Railway Co	Yakutat.
Salteries, etc.—	
Mrs. A. E. King	Sunny Point.
Fred Brockman	Sarkaar.
Rasmus Engee	Petersburg.
James Thompson	Skowl Arm.
K. J. Johansen	Ideal Cove.
H. E. Heckman	Loring.
Louis Peterson	Threemile, Kupreanof Island.
Knutsen Brothers	West Point.
John Baronovitch	Skowl Arm.
Peter Jorgenson	Wrangell Narrows.
W. C. Waters	Holbrook.
John H. Mantle	Olive Bay.
Forss & Skodlung	Thorne Bay.
Craig Millar	Hunter Bay.

Name.	Location.
Southeast Alaska—Continued.	
Salteries, etc.—Continued.	
Peter Sommers	Petersburg.
Alex. S. Millar	Nakat Inlet.
Beauclerc Salting Co	Beauclerc Bay.
S. E. Robertson	Moira Sound.
Globe Fishing and Packing Co	Dall Island.
Knute Hauge	Wrangell Narrows.
M. E. Lane	Prince of Wales Island.
H. Appleton	Gasoline sloop Capella.
W. A. Thompson, John Wilson, C. J. Parker	Gasoline vessels Annie M and Eurus.
Engelbr. Wiese	Stikine River and Ketchikan.
J. Lindenberger (Incorporated)	Ketchikan, Klawak, and Douglass.
J. T. Field	Petersburg.
A. H. Sonsthagen	Cape Fanshaw.
Malcolm Campbell	Alsek River.
Schooner "C. Seward"	Juneau.
Schooner "Alcedo"	Do.
Central Alaska:	
Canneries—	
Alaska Packers Association	Chignik, Karluk, Alitak, and Kasilof.
Northwestern Fisheries Co	Orca, Uyak, and Chignik.
Salteries, etc.—	
Alaska Commercial Co	Kodiak.
Blodgett & Blinn	Do.
J. A. Herbert	English Bay.
San Juan Fishing and Packing Co	Kenai.
Thin Point Packing Co	Thin Point and Simeonof Island.
B. Omundsen	Osonio.
Western Alaska:	
Canneries—	
Alaska Packers Association	Naknek River, Ugaguk River, Nushagak Bay, and Kvichak Bay.
Northwestern Fisheries Co	Nushagak Bay.
Red Salmon Canning Co	Ugashik River.
North Alaska Salmon Co	Nushagak Bay, Lockonok, Kvichak River, and Ugaguk River.
Naknek Packing Co	Naknek River.
L. A. Pedersen	Kvichak Bay.
Alaska-Portland Packers Association	Nushagak Bay.
Columbia River Packers Association	Do.
Alaska Fishermen's Packing Co	Do.
Alaska Salmon Co	Wood River.
Salteries, etc.—	
Alaska Packers Association	Ugashik River.
Lagoon Salmon Co	Nelsons Lagoon.
Peter M. Nelson	Igushik River.
Nelson, Olsen & Co	Kvichak Bay.

DISASTERS.

So far as loss of life is concerned, this has been the most disastrous year the salmon industry has ever known.

On August 19, as the ship *Lucille*, belonging to the Red Salmon Canning Company, of San Francisco, Cal., was leaving the Ugashik River with the season's pack and cannery crew, she was caught in a gale and driven ashore, where she became a total wreck. The cargo, consisting of about 39,000 cases of canned salmon and 802 barrels and 16 tierces of salted salmon, was entirely destroyed, but fortunately no lives were lost. The *Lucille*, built in Freeport, Me., in 1874, had a gross tonnage of 1,402 and a net tonnage of 1,297.

A disaster without parallel in the history of the Alaska salmon industry, or in that of any of the other fisheries of this country,

occurred the morning of September 20, when the Alaska Packers Association bark *Star of Bengal* (Nicholas Wagner, master), while on her way from the association's cannery at Wrangell with the season's pack and the cannery and fishing crews, was wrecked on Coronation Island, in southeast Alaska, and 111 persons (15 whites, including the foreman, bookkeeper, and machinist; 67 Chinese, 26 Japanese, and 3 Filipinos) lost their lives. The vessel and cargo were a total loss, and of the 138 persons aboard but 27 (17 whites, including the master and first mate; 7 Japanese, 2 Chinese, and 1 Filipino) were saved.

The bark left the cannery the day before the wreck in tow of two tugs, which were to continue with her until the open ocean was reached. Shortly after passing out of Sumner Strait a gale sprang up from the south and in a few hours the wind was blowing with terrific force. About 4 o'clock in the morning of the 20th the tugs, finding that despite their exertions the vessel was rapidly drifting onto Coronation Island, cut their tow lines after the bark had anchored, and steamed back to the strait for shelter. The bark held her anchors until 9.30 a. m., when she began to drag. At 10.26 she struck, and in a few minutes was battered to pieces on the rocks. In the meantime a volunteer crew of 5 white men, led by the first mate, had bravely pulled a boat to shore through the raging surf in order to rig up a breeches buoy, but before anything could be accomplished the vessel went ashore. Many of those not carried down with the vessel itself lost their lives in the pounding and grinding mass of wreckage and cargo between the outer rocks and the shore, but few getting through this alive.

The *Star of Bengal* was a bark with a gross tonnage of 1,877 and a net tonnage of 1,694. She was of iron and was built at Belfast, Ireland, in 1873. When launched the vessel was under the British flag and ship-rigged. Later she was transferred to Hawaiian registry, rerigged as a bark, and when the Hawaiian Islands were annexed by this country secured the privilege of flying the American flag.

HATCHERIES.

Seven salmon hatcheries were operated during the season of 1907–8, as follows:

Name.	Location.	Owners and operators.
Fortmann	Naha Stream	Alaska Packers Association.
Karluk	Karluk River	Do.
Klawak	Klawak Lake	North Pacific Trading and Packing Co.
Hetta	Hetta Lake	Northwestern Fisheries Co.
Quadra	Quadra Stream	Do.
Yes Lake	Yes Lake	U. S. Bureau of Fisheries.
Afognak	Afognak Island	Do.

During the preceding season but five hatcheries were operated, the increase being due to the near-completion of the Afognak hatchery and the renewal of operations at Quadra hatchery, which was built in 1901, but has been idle in recent years. The initial take of eggs was made at Afognak, but the season did not fulfill expectations, the light run in this region preventing the hatchery from filling its troughs. The first eggs were taken July 27 and the last on August 26. Hatching began about October 31.

At Fortmann hatchery likewise the results were disappointing, as its capacity is over 100,000,000 eggs and not one-fourth of this number was secured. This was the more unexpected since there was a good showing of fish in the Naha during the summer and no difficulty was anticipated in obtaining a full quota of eggs. At spawning time the ripe fish did not frequent in numbers their usual beds in the vicinity of the hatchery at the head of Heckman Lake. Large schools were, however, found at the head of Jordan Lake, which is the next of the series below Heckman Lake, and in the stream connecting the two. Obstructions made this region a bad collecting ground, and before it could be sufficiently cleared the season had ended with a small take.

At Fortmann hatchery an attempt to propagate plankton as food for salmon fry has been begun. It is hoped that the small organisms sought will multiply in trenches filled with cow manure and connected with the lake.

At Yes Lake anticipations were not realized, and the egg season ended with the hatchery about two-thirds full. There appeared to be plenty of salmon in the lake, but during the latter part of the season high water carried many of them past the hatchery racks, where they were inaccessible to the spawn takers.

Hetta hatchery had prepared to accommodate 11,000,000 eggs. Two distinct runs occur in Hetta Lake, the first going to the main creek at the head of the lake, the other to the hatchery creek nearer the foot of the lake. The earlier run yielded 5,000,000 eggs, and as this was about four times the number secured from the first run in 1907 it was confidently expected to fill the hatchery. The second run proved so short that the take fell considerably below the hatchery's capacity.

In division no. 1 of the United States district court for Alaska the grand jury, sitting at Skagway in July, 1908, included among its recommendations the following:

> We believe that the Government should own and operate the hatcheries and would recommend that one be established in this vicinity.

OUTPUT OF THE SALMON HATCHERIES OF ALASKA.

Hatcheries.	1907–8. Sockeye. Eggs taken.	1907–8. Sockeye. Fry liberated.	1908–9. Sockeye. Eggs taken.	1908–9. Coho. Eggs taken.
Karluk	47,808,200	43,655,000	40,320,000	
Fortmann	41,280,000	33,920,000	24,465,000	
Yes Lake	65,550,000	61,369,000	50,000,000	17,000
Afognak			46,380,000	
Klawak	3,500,000	2,776,000	3,200,000	
Hetta	8,000,000	6,125,000	[a] 7,600,000	
Quadra			[a] 5,000,000	

[a] Approximate.

STATISTICS.

CATCH.

Below will be found a table showing, for the geographic sections, by apparatus and species, and by species alone, the number of salmon caught in the years 1906, 1907, and 1908.

The noticeable feature of this table is the large increase in the number of salmon taken by gill nets. In 1907 the gill-net catch dropped off very materially. The increase in 1908, which occurs in western Alaska almost wholly and is made up of red salmon, is due principally to the excellent run in Bristol Bay and to the increase of apparatus consequent upon the closing of Wood River to fishing. Dog and coho salmon caught in gill nets appear in decreased numbers each season. The seine catch has almost held its own as compared with 1907. Humpback salmon comprise more than half the catch in this form of apparatus. There has been a large increase in the number of traps in recent years. In 1905, 70 traps were used; in 1906, 65; in 1907, 79; and in 1908, 101 traps. Southeast Alaska increased the number of her traps from 32 in 1905 to 65 in 1908; central Alaska decreased from 23 in 1905 to 22 in 1908, and western Alaska decreased from 15 in 1905 to 14 in 1908. The closing this year of Wood River to all fishing threw out 6 traps from the river, but 5 were added in Nushagak Bay, making a net decrease of 1 in western Alaska. As a result of the large increase in traps in southeast Alaska the catch in this form of apparatus shows a very considerable increase over 1906 and 1907, this increase being made up almost wholly of humpback salmon. The decrease in the spear catch is due

to the refusal of most of the cannery men to purchase hooked fish caught by the fishermen on the Chilkoot River.

The table shows also a large increase (2,437,433 fish over 1907 and 7,398,156 fish over 1906) in the catch of humpback salmon, also a large increase (5,775,616 fish) in the catch of red salmon, a small increase in the catch of dog salmon, and a decrease in the catch of coho and king salmon. The decrease in the coho catch is due to the lateness of the run of this species. Owing to the heavy run of other species in southeast Alaska, most of the canneries had completed their packs before the main portion of the coho run appeared. Nearly all of the increases occur in southeast and western Alaska.

Catch of Salmon in Alaska in 1906, 1907, and 1908, by Sections, Species, and Apparatus.

Apparatus and species.	Southeast Alaska.			Central Alaska.		
	1906.	1907.	1908.	1906.	1907.	1908.
Seines:						
Coho, or silver	309,154	302,963	273,993	23,738	48,759	60,847
Dog, or chum	1,157,139	1,101,822	1,378,339			
Humpback, or pink	5,722,877	8,614,551	8,900,467		252,373	268,466
King, or spring	1,122	259	1,812	3,640	4,015	3,028
Sockeye, or red	1,502,389	1,419,221	1,691,149	4,068,582	3,568,069	2,709,750
Total	8,692,681	11,438,816	12,245,760	4,095,960	3,873,216	3,042,091
Traps:						
Coho, or silver	256,708	139,783	119,034	93,485	163,076	90,616
Dog, or chum	355,048	158,170	368,709			
Humpback, or pink	1,377,439	3,438,335	5,102,843	64,100	6,420	375,140
King, or spring	4,335	26,835	3,448	16,858	36,791	17,216
Sockeye, or red	615,261	615,684	486,646	1,487,606	2,711,142	2,285,401
Total	2,608,791	4,378,807	6,080,680	1,662,049	2,917,429	2,768,373
Gill nets:						
Coho, or silver	91,609	83,943	84,176		15,000	
Dog, or chum	58,522	74,298	56,431			
Humpback, or pink	99,496	18,029	59,582			
King, or spring	30,956	70,388	64,148	7,869	27,022	18,351
Sockeye, or red	353,383	214,442	378,834	441,491	358,649	512,464
Total	633,966	461,100	643,171	449,360	400,671	530,815
Lines:						
Coho, or silver	2,500	1,052	1,329			
King, or spring	58,174	23,082	61,633			
Total	'60,674	24,134	62,962			
Spears:						
Sockeye, or red	52,823	20,000	4,000			
Wheels:						
King, or spring			27			
Total:						
Coho, or silver	659,971	527,741	478,532	117,223	226,835	151,463
Dog, or chum	1,570,709	1,334,290	1,803,479			
Humpback, or pink	7,199,812	12,070,915	14,062,892	64,100	258,793	643,606
King, or spring	94,587	120,564	131,068	28,367	67,828	38,595
Sockeye, or red	2,523,856	2,269,347	2,560,629	5,997,679	6,637,860	5,507,615
Grand total	12,048,935	16,322,857	19,036,600	6,207,369	7,191,316	6,341,279

Catch of Salmon in Alaska in 1906, 1907, and 1908, by Sections, Species, and Apparatus—Continued.

Apparatus and species.	Western Alaska.			Total.		
	1906.	1907.	1908.	1906.	1907.	1908.
Seines:						
Coho, or silver				322,892	351,722	334,840
Dog, or chum				1,157,139	1,101,822	1,378,339
Humpback, or pink				5,722,877	8,866,924	9,168,933
King, or spring				4,762	4,274	4,840
Sockeye, or red				5,570,971	4,987,290	4,400,899
Total				12,788,641	15,312,032	15,287,851
Traps:						
Coho, or silver	1,500	29,199	20,000	351,693	332,058	229,650
Dog, or chum	466,632	36,141	114,534	821,680	194,311	483,243
Humpback, or pink	352,526	1,500	261,519	1,794,065	3,446,255	5,739,502
King, or spring	6,530	5,011	4,856	27,723	68,637	25,520
Sockeye, or red	791,166	1,078,869	860,516	2,894,033	4,405,695	3,632,563
Total	1,618,354	1,150,720	1,261,425	5,889,194	8,446,956	10,110,478
Gill nets:						
Coho, or silver	206,110	109,650	86,088	297,719	208,593	170,264
Dog, or chum	1,222,043	472,586	340,309	1,280,565	546,884	396,740
Humpback, or pink	91,561	337,514	138,138	191,057	355,543	197,720
King, or spring	138,343	134,391	87,174	177,168	231,801	169,673
Sockeye, or red	10,224,060	9,181,034	16,013,966	11,018,934	9,754,125	16,905,264
Total	11,882,117	10,235,175	16,665,675	12,965,443	11,096,946	17,839,661
Lines:						
Coho, or silver				2,500	1,052	1,329
King, or spring				58,174	23,082	61,633
Total				60,674	24,134	62,962
Spears:						
Sockeye, or red				52,823	20,000	4,000
Wheels:						
King, or spring						27
Total:						
Coho, or silver	207,610	138,849	106,088	984,804	893,425	736,083
Dog, or chum	1,688,675	508,727	454,843	3,259,384	1,843,017	2,258,322
Humpback, or pink	444,087	339,014	399,657	7,707,999	12,668,722	15,106,155
King, or spring	144,873	139,402	92,030	267,827	327,794	261,693
Sockeye, or red	11,015,226	10,259,903	16,874,482	19,536,761	19,167,110	24,942,726
Grand total	13,500,471	11,385,895	17,927,100	31,756,775	34,900,068	43,304,979

CANNING.

At the beginning of the year but few cases of the previous year's pack, except of pink salmon, were left in the hands of the canners or brokers. Pink salmon has been almost a drug on the market since the close of the 1907 season, owing largely to a cessation of the demand throughout the Southern States, the chief market for this grade of salmon. As the end of the canning season approached this year, certain packers began to cut prices on pink salmon, and consequently the market soon became demoralized. After prices appeared to have reached the bottom, however, the demand increased somewhat. All other grades of salmon were in excellent demand at good prices, and the greater part of the pack was marketed by the first of

the year. The export demand for red salmon, which fell off considerably in 1907, was this year better than ever.

Persons engaged.—The fishermen engaged this year numbered 3,378, of whom almost two-thirds were white. The cannery employees numbered 7,214, among whom the Japanese were for the first time more numerous than any other single nationality. The transporters numbered 493, a slight decrease from 1907. In all, 11,085 persons (4,403 whites, 2,250 Indians, 2,415 Japanese, and 2,017 Chinese) were employed in this branch of the fishing industry.

PERSONS ENGAGED IN THE SALMON CANNING INDUSTRY IN 1908.

Occupation and race.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites	525	406	1,508	2,439
Indians	844	16	62	922
Japanese	17			17
Total	1,386	422	1,570	3,378
Shoresmen:				
Whites	312	258	922	1,492
Indians	810	106	391	1,307
Chinese	765	393	859	2,017
Japanese	422	373	1,603	2,398
Total	2,309	1,130	3,775	7,214
Transporters:				
Whites	204	128	140	472
Indians	14		7	21
Total	218	128	147	493
Grand total	3,913	1,680	5,492	11,085

Investment.—There were 129 steamers and launches and 37 sailing vessels engaged in transporting. Of these the ship *Lucille* was wrecked and lost at the mouth of the Ugashik River, in Bristol Bay, on August 19, and the bark *Star of Bengal* was wrecked and lost off Coronation Island, in southeast Alaska, on September 20, with an appalling loss of life.

Gill nets were the principal form of apparatus in use, by far the greater part being employed in western Alaska. Purse seines, which have been employed almost exclusively heretofore in southeast Alaska, are coming into use in central Alaska. Haul seines and traps are most numerous in southeast Alaska. A wheel appears in the table for the first time.

There were 50 canneries in operation (23 in southeast Alaska, 8 in central Alaska, and 19 in western Alaska), an increase of 2 over 1907. One of the reserve canneries in western Alaska was reopened, and there was a new cannery, that of the Astoria and Puget Sound Packing Company, on Excursion Inlet, southeast Alaska, in operation.

INVESTMENT IN THE SALMON CANNING INDUSTRY IN 1908.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Canneries	23	....	8	....	19	....	50	....
Transporting vessels:								
Steamers and launches	63	$354,900	24	$225,100	42	$622,550	129	$1,202,550
Tonnage	1,603	....	1,256	....	3,008	....	5,867	....
Sailing	5	158,500	8	316,000	24	587,900	37	1,062,400
Tonnage	7,365	....	13,216	....	34,857	....	55,438	....
Boats	607	116,140	332	71,905	885	293,835	1,824	481,880
Apparatus:								
Haul seines	53	15,891	22	16,500	....	....	75	32,391
Purse seines	115	36,214	26	7,000	....	....	141	43,214
Gill nets	84	10,680	12	1,800	875	72,875	971	85,355
Traps, stake	46	129,500	18	28,050	11	14,000	75	171,550
Traps, floating	15	20,100	1	1,500	....	....	16	21,600
Wheel	1	1,000	....	....	....	....	1	1,000
Shore and accessory property	....	1,968,047	....	1,189,941	....	2,595,053	....	5,753,041
Total	....	2,810,972	....	1,857,796	....	4,186,213	....	8,854,981

Output.—The table of products shows the quantity and value of each species packed, with size and style of can. Western Alaska leads in the quantity and value of the pack, followed by southeast and central Alaska in the order named, Red, or sockeye, salmon predominate, especially in western Alaska. Humpbacks are second in quantity and value. Of the total pack given below the following were lost in the various disasters mentioned elsewhere in this report: Coho, 2,125 cases; dog, or chum, 3,448 cases; humpback, 45,863 cases; king, 582 cases; and red, 38,962 cases. These have been included in the statistical tables, as they had passed through all the stages of packing and were eventually paid for by the insurance companies.

OUTPUT OF SALMON FROM THE CANNERIES IN 1908, BY SPECIES AND SIZE OF CANS.[a]

Products.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
Coho, or silver:								
½-pound flat	209	$627	....	....	....	....	209	$627
1-pound flat	2,414	9,903	....	....	....	....	2,414	9,903
1-pound tall	46,340	183,683	11,543	$46,172	8,426	$33,704	66,309	263,559
Total	48,963	194,213	11,543	46,172	8,426	33,704	68,932	274,089
Dog, or chum:								
1-pound flat	107	321	....	....	....	....	107	321
1-pound tall	180,097	452,357	....	....	38,309	101,519	218,406	553,876
Total	180,204	452,678	....	....	38,309	101,519	218,513	554,197
Humpback, or pink:								
1-pound flat	569	1,590	....	....	....	....	569	1,590
1-pound tall	592,069	1,587,822	30,661	85,673	20,834	58,294	643,564	1,731,789
Total	592,638	1,589,412	30,661	85,673	20,834	58,294	644,133	1,733,379

[a] All pound cases contain 48 1-pound cans; the ½-pound cases contain 48 ½-pound cans.

OUTPUT OF SALMON FROM THE CANNERIES IN 1908, BY SPECIES AND SIZE OF CANS—Continued.

Products.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
King, or spring:								
½-pound flat	125	$425					125	$425
1-pound tall	2,427	9,931	6,416	$27,040	14,824	$62,471	23,667	99,442
Total	2,552	10,356	6,416	27,040	14,824	62,471	23,792	99,867
Red, or sockeye:								
½-pound flat	21,817	68,083					21,817	68,083
1-pound flat	26,950	138,120					26,950	138,120
1-pound tall	149,599	668,272	377,101	1,720,857	1,087,211	4,928,919	1,613,911	7,318,048
Total	198,366	874,475	377,101	1,720,857	1,087,211	4,928,919	1,662,678	7,524,251
Grand total	1,022,723	3,121,134	425,721	1,879,742	1,169,604	5,184,907	[a]2,618,048	10,185,783

[a] Reduced to a common basis of cases containing 48 1-pound cans the pack is 2,606,972 cases.

Comparison of pack of 1905, 1906, 1907, and 1908.—Of the four years in question the pack of 1908 exceeds all the others in both quantity and value, and is the largest made since the beginning of the industry. The pack of red salmon in 1908 is larger than in any other year. But few ½-pound flat cans were packed in 1908 as compared with the other years.

Taking the "1-pound tall," which is the common size can, as a basis of comparison, it is seen that cohos averaged $3.98 per case, an increase of 7 cents per case over 1907; dog, or chum, salmon averaged $2.53 per case, a decrease of 44 cents as compared with 1907; humpback, or pink, salmon averaged $2.69 per case, a decrease of 47 cents as compared with 1907; king salmon averaged $4.20 per case, an increase of 2 cents as compared with 1907; while the red, or sockeye, salmon averaged $4.52 per case, a decrease of 7 cents per case as compared with 1907.

COMPARISON OF THE OUTPUT OF THE SALMON CANNERIES IN 1905, 1906, 1907, AND 1908.

Products.	1905.		1906.		1907.		1908.	
	Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
Coho, or silver:								
½-pound flat	1,032	$1,754	3,217	$6,588	969	$4,273	209	$627
1-pound flat	394	1,340	15,944	63,487	3,933	17,292	2,414	9,903
1-pound tall	66,484	212,781	91,582	312,034	80,772	315,819	66,309	263,559
Total	67,910	215,875	110,743	382,109	85,674	337,384	68,932	274,089
Dog, or chum:								
½-pound flat					491	1,228		
1-pound flat					664	2,125	107	321
1-pound tall	41,972	113,056	254,812	730,235	183,262	544,404	218,406	553,876
Total	41,972	113,056	254,812	730,235	184,417	547,757	218,513	554,176

COMPARISON OF THE OUTPUT OF THE SALMON CANNERIES IN 1905, 1906, 1907, AND 1908—Continued.

Products.	1905.		1906.		1907.		1908.	
	Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
Humpback, or pink:								
½-pound flat			2,940	$4,851	17,589	$46,093		
1-pound flat			2,618	8,378	7,406	26,662	569	$1,590
1-pound tall	168,597	$498,194	344,209	1,033,722	545,772	1,726,525	643,564	1,731,789
Total	168,597	498,194	349,767	1,046,951	570,767	1,799,280	644,133	1,733,379
King, or spring:								
½-pound flat			189	397	28	98	125	425
1-pound flat	4,248	17,585						
1-pound tall	37,877	124,414	30,748	115,825	43,410	181,620	23,667	99,442
Total	42,125	141,999	30,937	116,222	43,438	181,718	23,792	99,867
Sockeye, or red:								
½-pound flat	25,830	46,674	49,541	125,395	45,383	160,731	21,817	68,083
1-pound flat	18,725	67,410	36,763	161,793	29,821	154,646	26,950	138,120
1-pound tall	1,542,788	5,221,463	1,414,426	5,333,687	1,242,600	5,599,850	1,613,911	7,318,048
Total	1,587,343	5,335,547	1,500,730	5,620,875	1,317,804	5,915,227	1,662,678	7,524,251
Grand total	1,907,967	6,304,671	2,246,989	7,896,392	2,202,100	8,781,366	2,618,048	10,185,783

The construction of several new canneries is under consideration at present, one to be located on the Italio River, one of the small streams debouching directly into the ocean between Yakutat and Dry bays; another on the Alsek River, a tributary of Dry Bay, and one on Hawk Inlet, Admiralty Island, all in southeast Alaska.

Mr. R. A. Leonard, of Haines, last year put up a salmon product which he called "Flaxsamo." The fish were lightly smoked and then shaved into thin strips, like chipped beef, and packed in hermetically sealed cans, a little oil being used for preservation.

PICKLING.

The salmon salteries met with fair success this season, but the prices realized for the prepared products were not so good as in 1907.

The scheme of the United States Bureau of Education to send an experienced salter to its station on Kotzebue Sound, as mentioned in the 1907 report, in order to instruct the natives in the best and latest methods of pickling salmon has not yet been carried out, but probably will be in a year or two.

A company known as the Alaska Fish and Cold Storage Company, said to be composed largely of Boston capitalists, late in the spring began the construction of a cold-storage plant at a point on Wrangell Narrows near the southern end, which it named Kems. Several of the smaller buildings and a part of the wharf had been completed when financial difficulties, with lawsuits and attachments, tied up the work, with apparently but small prospect of continuance by the

present company. It had been the company's intention to freeze salmon, halibut, trout, etc.

The saltery mentioned in previous reports as having been sent to the Kuskokwim River is still cached at Bethel, nothing having been done this year. There is a large annual run of king salmon in this river, however, and the natural difficulties of operating, owing to the ice remaining in the river when the king run begins, will in time, no doubt, be overcome. This year 88 barrels of king salmon, valued at $1,056, were shipped from the river by traders, who got them from the natives.

Persons engaged.—This year 540 persons (of whom 243 were fishermen, 272 shoresmen, and 25 transporters), an increase of 57 over 1907, were engaged in the pickling industry.

PERSONS ENGAGED IN THE SALMON-PICKLING INDUSTRY IN 1908.

How engaged.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites	63	23	46	132
Indians	20	87	4	111
Total	83	110	50	243
Shoresmen:				
Whites	48	18	73	139
Indians	43	50	39	132
Japanese		1		1
Total	91	69	112	272
Transporters:				
Whites	13	3	7	23
Indians		2		2
Total	13	5	7	25
Grand total	187	184	169	540

Investment.—There were 35 salteries (23 in southeast Alaska, 7 in central Alaska, and 5 in western Alaska) in operation, an increase of 11 over 1907. In addition, some of the canneries and several of the mild-curing plants also salted their surplus catch, and while the product has been included in the present figures the men and investment could not be separated from the statistics of the other branches of the industry. Omitting these, the total investment in the pickled-salmon industry amounted to $352,246, a gain of $42,933 over 1907.

INVESTMENT IN THE SALMON-PICKLING INDUSTRY IN 1908.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Salteries	23		7		5		35	
Transporting vessels:								
Steamers and launches	14	$19,300	2	$8,000	3	$3,900	19	$31,200
Tonnage	95		39		15		149	
Sailing	3	1,400	3	2,800	4	41,500	10	45,700
Tonnage	20		63		1,503		1,586	
Boats	70	5,079	63	5,115	56	9,482	189	19,676
Apparatus:								
Haul seines	13	2,460	16	1,045			[a] 29	3,505
Purse seines	9	2,650	2	150			[b] 11	2,800
Gill nets	7	760			39	2,960	[c] 46	3,720
Traps, stake	4	4,400	3	2,800	3	2,325	10	9,525
Shore and accessory property		55,100		24,000		157,020		236,120
Total		91,149		43,910		217,187		352,246

[a] Aggregate length of 4,610 yards. [b] Aggregate length of 2,240 yards. [c] Aggregate length of 8,150 yards.

Output.—The output amounted to 35,949 barrels and 6,247 half-barrels, with a total value of $352,707. This is an increase of 12,767 barrels and 2,067 half-barrels in quantity and $112,158 in value over 1907. As usual, red salmon formed by far the greater part of this pack, most of these being put up in western Alaska. Some dog-salmon bellies were also packed this year. As 1908 was the last year in which the packing of salmon bellies by process involving waste was permitted, some salteries made an especial effort to get up a big pack, and the result shows in an increase for all species.

In the wreck of the ship *Lucille* in August, 1,102 barrels (comprising 983 barrels of red salmon, 25 barrels of red-salmon bellies, 93 barrels of pink salmon, and 1 barrel of king salmon) and 16 tierces of king salmon were lost. These, however, as in the case of the canned salmon, have been included in the statistical tables.

QUANTITY OF SALMON PICKLED IN 1908, BY SPECIES.

Products.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Coho, or silver ... barrels	592	$4,898	100	$750			692	$5,648
Coho bellies ... do	38	380	191	3,155			229	3,535
Dog, or chum ... do	122	707					122	707
Dog bellies ... do	117	699					117	699
Humpback, or pink ... do	2,253	17,191			93	$744	2,346	17,935
Humpback bellies ... half-barrels	517	3,347					517	3,347
Do ... barrels	2,148	24,313	40	480			2,188	24,793
King, or spring ... do			60	480	600	6,333	660	6,813
King bellies ... do					48	720	48	720
Red, or sockeye ... half-barrels					5,730	26,664	5,730	26,664
Do ... barrels	144	1,389	2,420	19,480	25,088	214,741	27,652	235,610
Red bellies ... do	35	386	1,780	24,770	80	1,080	1,895	26,236
Total ... half-barrels	517				5,730		6,247	
Total ... barrels	5,449	53,310	4,591	49,115	25,909	250,282	35,949	352,707

MILD CURING.

The business of mild curing king salmon was much overdone on this coast in 1907. Thinking that the heavy demand and high prices of 1906 would continue indefinitely, the packers put up large quantities, including quite small fish, and even the white-meated, which had been cured but sparingly before. The practice has been to sell the largest and finest red-meated fish in Europe, reserving the smaller red-meated fish for smokers in the eastern part of this country. Last winter, however, one of the packers, finding himself with too large a supply on hand, offered some of his best goods to the eastern smokers, who thereafter refused to consider the small red-meated fish or the white-meated ones, and the packers were thus left with a large quantity of unsalable goods on their hands. The high prices had also driven some of the smokers to return to the use of hard-cured kings, which were selling at a much lower figure than the mild cured. The demand in Europe for the better grade of mild-cured fish, especially in Germany, which was then under a financial and business depression, also fell off very materially. In consequence the year opened with much discouragement, and while there was some improvement as the season advanced, the industry at no time attained the dimensions of the season of 1907. Warned by last season's experience, the packers cured but few small red-meated or white-meated fish. In 1907 one packer mild-cured a quantity of coho, dog, and humpback salmon, but he found so much difficulty in disposing of the product that he abandoned further efforts in this line.

In mild curing the fish are split down the middle, the head, tail, and all fins except the pectorals removed, and the backbone cut out. The fish is then in two halves. Each of these halves, or sections, is then scored on the outside eight or nine times with the knife. The inner side of each section is then carefully scraped clear of blood and membrane with a knife, while the outside is thoroughly cleaned with a scrubbing brush. The sections are then laid carefully, inner side up, into a tierce partly filled with fresh water and cracked ice, in which they remain for an hour cooling off. Formerly the fish were put into brine, but it has been found that ice water answers the purpose much better. After being thoroughly cooled the sections are salted down in the tierces, each one being laid with its tail toward the center. Usually about 50 whole fish are required to fill a tierce, but one fisherman brought in several tierces this summer which ran 27 to the tierce, a most unusual size. In dressing the fish, slightly over one-fourth is lost. The fish are but lightly salted, and owing to this must be kept in cold storage until used. As stated above, the principal consumers of these fish are the smokers, who take

them from the tierce, wash them for a few minutes, and then have a practically fresh fish to smoke, and not, as in the days when hard-pickled salmon were used, one that had lost most of its oil and flavor through the excessive amount of salt needed to preserve it.

With the exception of a large plant at Kenai, on Cook Inlet, the total pack was put up in southeast Alaska, and amounted to 1,122 tierces, valued at $62,451, in southeast Alaska, and 256 tierces, valued at $15,360, in central Alaska, a somewhat smaller pack than in 1907.

MINOR PRESERVING PROCESSES.

Dry salting and drying.—At English Bay, in Cook Inlet, and a few other places in central Alaska, the bellies of red and coho salmon are cut out and salted, after which the backs are dried in the sun and after being thus cured are used for fox food at the fox ranches. This product is called "ukalu."

For several years a large quantity of dog salmon was dry salted for the Japanese trade, but owing to a rapidly diminishing demand since the Russian-Japanese war, less and less of this is prepared each season, the pack this year amounting to but 20,800 pounds, valued at $416, a decrease of 86,780 pounds in quantity and $1,089 in value, as compared with 1907.

Smoking.—A delicious smoked product, known locally as "beleke," is put up at Kodiak, red and coho salmon being utilized. In preparing this only the backs of the fish are used, the belly part being cut out and salted separately. The backs are divided into three grades, according to size, viz, "small," "medium," and "large." They are first put into a brine, the large being put in first, followed by the medium and small at intervals of one hour each, this being done so that all will be cured at about the same time, the larger fish requiring longer time than the smaller. The red salmon backs are allowed to remain in the brine about sixteen hours, but as the coho backs are larger they are kept in the brine from nineteen to twenty hours. After being thoroughly salted the backs are removed from the brine and rinsed in fresh water, then hung up in the sun for about twenty-four hours to dry and to allow a thin skin to form on the outside. They are then hung up in the smokehouse, in the presence of a little fire of cottonwood or alder. On dry days the gable windows are thrown open and the wind allowed to pass through while the smoking is going on. The smoking must be done slowly, a couple of weeks being devoted to it. There is a good demand for this product locally, and the fish sell for from 15 to 20 cents a pair.

Freezing.—The only establishment engaged in freezing salmon is at Taku Harbor, in southeast Alaska. The species handled this year were king, red, silver, and dog. Other species of fish frozen

were halibut, steelhead and Dolly Varden trout, black bass, and red rock cod.

Fresh salmon.—Owing to a shortage of salmon on the Columbia and Sacramento rivers, and an unprecedented demand from the eastern part of the country for fresh salmon, the shippers of fresh king salmon found a ready market for their fish, and as a result the shipments far exceed those of previous years. It was the more easily possible to supply this demand, as the mild curers, for reasons stated elsewhere, did not compete for the white-meated or the small red-meated kings. Ketchikan, Wrangell, Petersburg, Juneau, and Tee Harbor were the principal shipping points. For shipping fresh the kings are opened down the belly, the viscera and gill rakers are removed, and the fish are then packed in ice in boxes.

During the course of the season 36,286 king salmon were disposed of in a fresh condition, principally outside of the district. A considerable quantity of red, coho, and humpback salmon were also disposed of locally in a fresh condition.

FISHERY NOTES.

KING-SALMON FISHERY.

This fishery is gradually developing into an all the year round industry. In southeast Alaska, during the winter and spring months, king salmon are to be found in most of the bays, sounds, and straits, feeding upon the herring, smelt, eulachons, etc. In the spawning season—May and June—the principal streams which this species enter and ascend are the Unuk, Stikine, Taku, and Alsek rivers, in southeast Alaska; the Copper and Kenai rivers, in central Alaska; and the Ugashik, Ugaguk, Naknek, Kvichak, Nushagak, Togiak, Kuskokwim, and Yukon, in western Alaska. Owing to the distance from markets and the lack of rapid transportation facilities, the handling of fresh king salmon is confined to southeast Alaska, but as soon as the latter handicap is overcome there will doubtless be a large development in this line in the other two sections. In the early part of August the kings reappear in Frederick Sound and Seymour Canal, gradually extending their range until the greater part of southeast Alaska is once more covered. They are then feeding upon the herring and smelt.

While the fish are feeding they are caught solely by trolling. In this method the white fishermen generally use either the Hendryx Seattle trout bait spoon No. 5 or the Hendryx Puget Sound No. 8. The former comes in nickel or brass and nickel and brass; the full nickel is preferred. The Siwash hook No. 9/O, known as the Victoria hook in British Columbia, is in quite general use. As a rule but one hook is used, and this hangs from a ring just above the spoon, while

the point of the hook comes a little below the bottom of the spoon. Occasionally double or treble hooks are used. Some fishermen use bait, and when this is done the herring, the bait almost universally employed, is so hooked through the body as, when placed in the water, to stretch out almost straight and face forward as in life.

When the kings begin to school preparatory to ascending the rivers to spawn, they are then taken by means of gill nets. A few traps were placed in the water early in May this year in order to catch kings, but they were all failures, owing doubtless to the fact that at this season the kings are feeding and consequently do not school.

Gill nets are usually drifted back and forth with the tide, but in Dry Strait, near Wrangell, into which the Stikine River debouches, a different method is employed. Here the strait, except in certain narrow channels and pools called "sloughs," becomes absolutely bare at low tide. As the tide is ebbing the kings, which remain in the strait for some time before entering the river, slowly drift backward down with it. The king is a wary fish, however, and always resists the current to a certain extent. Were a gill net drifted with the tide but few kings would be meshed in it unless frightened, as their resistance to the tide would hold them at about the same distance from the moving net at all stages of the journey. To overcome this, the gill netters either anchor their nets or else use stakes to hold them. When stakes are employed a double row, about 8 feet apart, is used. The net is not attached to these stakes, but at about half ebb the net is paid out from the boat a short distance above the rows of stakes and is allowed to drift down and lodge against them. As soon as it is slack water the net is lifted and the fish removed. The net can then be carried to the other side of the stakes and fished with the flood tide.

During the winter some kings are taken on halibut trawls set at times in 30 and 40 fathoms of water in Ernest and Frederick sounds and Chatham Strait, and these kings have halibut, rock cod, and cod in their stomachs. At this season but little animal life is found near the surface, hence the kings are compelled to go deep in order to secure food.

In southeast Alaska, during the early part of the year, the kings were very erratic in their movements, due possibly to their pursuit of the herring, which latter species abandoned this year certain old-time resorts and sought new ones. The kings were not in very great abundance at any time, however. There was a good run of spawning fish in Cook Inlet, and in western Alaska, where the king is not much sought after as yet, the run of spawning fish was about up to the average, although the old fishermen say that the present runs do not begin to compare with those of ten and twelve years ago.

The large red-meated kings are mild cured, while the small red-meated and the white-meated fish of all sizes are usually shipped fresh. The competition for fish was not so keen as last year, and as a result prices were not so high. Early in the season 60 cents was paid for red-meated kings of 17 pounds and over, and 15 cents for all white-meated kings. All red-meated fish under 17 pounds were counted two for one. The prices soon rose to 75 cents for red-meated kings of 17 pounds and over (all under to count two for one), and 25 cents for all white-meated fish.

In southeast Alaska the proportion of white-meated king salmon varies considerably in different places. In the neighborhood of Tee Harbor last spring about half of the catch was white-meated fish, while in the vicinity of Wrangell the white-meated fish constituted about 35 per cent of the total catch. One trap set in the neighborhood of Auk Bay caught throughout the season 368 red-meated kings and 250 white-meated kings. In the Alsek River but 5 white-meated kings were caught during the season. The white-meated kings appear to be increasing in number, due doubtless to the much greater destruction amongst the more valuable red-meated fish. In the Cook Inlet region the run comprises red-meated fish alone, while in the Bristol Bay region, in western Alaska, the earliest runs are made up almost entirely of red-meated fish, the white-meated ones appearing in the later runs. As a rule the white salmon, in the neighborhood of Wrangell at least, are larger and fatter than the red-meated fish. Some of the fishermen have an idea that they are all males, but close inquiry developed the fact that this is not true, the proportion of males and females in the white-meated fish being about the same as with the red-meated ones.

In disposing of his catch the fisherman insists that the buyer shall take the white-meated kings along with the others, which he does at a considerably lower price. Even thus the buyer experiences considerable difficulty in disposing of them. At first the mild curers took the larger ones and cured them, but soon abandoned this, as it was found to be a difficult matter to dispose of them to the smokers, their principal customers. The greater part of these fish are now shipped fresh to Puget Sound points, where they are either sold as king salmon to consumers who know their excellence, or else disposed of under some other name.

Some of the fishermen claim that king salmon spawn at different periods of the year, and that they do not all die after spawning once. In proof of these beliefs they instance the numerous small kings found with well-developed spawn, and the many large kings with immature spawn. On June 11 one of the authors saw at Juneau a roe, from a king salmon weighing about 25 pounds, which measured, in one very slender strip, about 6 inches in length, and which was composed of

quite small and apparently immature eggs. He also opened upon the same date a very poor-looking female weighing about 12 to 15 pounds and found two quite small strips of roe with very small eggs. The latter fish had nothing in its stomach. Both fish were said to have been caught in Taku inlet, where kings are never found except when on their way to the spawning beds on the upper reaches of the river. A fish dealer who has been in the business in Juneau for a number of years states that he has met with several cases of small and immature roe in large kings, also of large roe in kings weighing from 10 to 15 pounds. One of the dealers at Wrangell this year reports running across kings with spawn in various stages of growth during the spring months. Large ones with small eggs seemed to be most numerous. While at Ideal Cove on May 25 a 7-pound king with milt was seen. At that time it was learned that several days before a female king of about the same size with fairly well developed roe had been handled, also a 20-pound king with eggs of about one-fourth the size of eggs in other fish taken at the same time.

It is very probable that the fish when on their way to the spawning beds continue feeding until they reach the river itself. On May 26 kings caught in Dry Strait and the lower reaches of the Stikine River were found to have eulachons, smelt, and needlefish (probably sand-launce) in their stomachs.

In Dry Strait on May 26 a fisherman caught a red-meated king salmon which was a rusty-brown in color exteriorly. Fishermen who saw it seemed to regard it as of a most unusual color and claimed never to have seen such before.

"WHITE WATER."

In 1907, during August and September, a white turbidity, or so-called "milkiness," was observed throughout large areas of sea water along the west coast of Prince of Wales Island. No one was able to account satisfactorily for the unusual phenomenon, a few, however, ascribing it to volcanic action. The fishermen claimed that it drove the red salmon away. In August of this year the white water again appeared on the same coast in the neighborhood of Hunter Bay, but did not last so long nor spread over so large an area as in 1907.

FISH WHEELS

This year the first fish wheel to be erected and operated in the coastal waters of Alaska was put in the Taku River, about 10 miles above its mouth. The wheel was located between two 4-foot scows, set parallel to each other, and each 40 feet in length. The wheel had two dips, each 22 feet in width and hung with netting. It was

operated throughout the king and red salmon runs, but was far from successful. The few salmon caught were taken mainly between Monday and Tuesday mornings, the first twenty-four hours after the weekly closed season had passed. Large numbers of trout and some eulachons were caught, but these were not salable.

HOOK-AND-LINE FISHING FOR SPAWNING SALMON.

It has been supposed that salmon when on the spawning beds would not take a baited hook. Observations in Ketchikan Creek indicate, however, that the humpback salmon, at least, is an exception. One of the agents saw several caught in September on a hook baited with salmon eggs, which they eagerly pursued, and he was assured by several reputable sportsmen who had fished in this, the principal salmon pool in the creek, for steelhead trout, that the humpback were very annoying because of their persistency in taking the bait, one man catching 7 in about an hour's time. At this time the humpbacks were in an advanced spawning condition, so much so that they were not considered fit for food.

TROLLING FOR COHO SALMON.

It has been known for several seasons that the coho salmon would take the trolling hook the same as the king salmon, but very little effort was made to turn this knowledge to commercial use. In August and September the fishermen trolling for king salmon in the neighborhood of Turnabout Island, in Frederick Sound, caught so many cohos that the dealers agreed to take all that were brought in, and as a result some of the fishermen made more money from their catch of cohos than from that of king salmon. A Stewart spoon with two hooks on one ring was used, baited with herring in such a way that the fish was straightened out and faced toward the spoon.

About the middle of September the sportsmen of Ketchikan discovered the game qualities of the coho. In fishing they used rod and reel, and a Hendryx spoon (kidney bait no. 6), which is silvery in color on one side and red on the other. The favorite fishing spot seemed to be off a small creek on Gravina Island, across from the head of Pennock Island, and the best time the flood tide. It was agreed that although much smaller in size than the king, the coho was much more game. About half an hour was required to land one and during the struggle the fish would break water and jump from 12 to 15 times. Those caught averaged about 12 pounds in weight, and despite the fact that it was the spawning season of the species, herring were invariably found in their stomachs.

FISHING LAWS AND THEIR ENFORCEMENT.

INDICTMENTS AND COMPLAINTS.

In view of reports early in the season that the trap-net fishermen were not going to observe the law, the waters of southeast Alaska were very thoroughly patrolled this year, and a cruise by the assistant agent in Stephens Passage, Lynn Canal, Chatham and Icy straits, extending from Saturday, July 4, to Monday afternoon, the 6th, covering some 300 miles and including visits to 38 traps, complete and in process of construction, disclosed a most remarkable condition of affairs. Of the 34 traps operating, 29 were brazenly violating the law, 4 were guilty of minor or technical violations, and but 1 trap was conforming strictly to the letter of the law. In addition to the traps mentioned, 1 was missed in the darkness, and there were 5 which it was impossible to reach during the closed season.

On another trip over practically these same waters, beginning early in the afternoon of July 11 and lasting until early the morning of the 13th, 36 traps, only 1 of which was in an unfinished condition, were visited and inspected. Eight were not visited owing to the lack of time. Of those visited and inspected 24 were found openly violating the law, and 3 were guilty of minor violations, but 8 conforming to the law. July 24 to 26 the traps were found to be generally conforming to the law, the few violations found being technical ones, and these minor offenses.

The district court of the first district of Alaska, then sitting at Skagway, heard these cases on the 16th and 17th. As a result of conferences with the district attorney beforehand, it had been decided not to present to the grand jury the offenders guilty of minor or technical violations. In all, 53 violations were brought before the grand jury, which reported true bills in every instance, and the corporation, partnership, or individual owning the trap, the superintendent or other officer actively representing the corporation or partnership, the head trap boss, the watchmen at the traps, and such other persons as participated directly in the violation of the law were indicted. The following are the trap owners who were indicted, together with the number of indictments found against each:

Name.	Location.	Indictments.
Pacific American Fisheries	Excursion Inlet	23
Alaska Packers Association	Pyramid Harbor	12
Columbia Canning Co	Haines	6
Thlinket Packing Co	Funter Bay	7
Northwestern Fisheries Co	Dundas Bay	1
Astoria and Puget Sound Packing Co	Excursion Inlet	1
George T. Myers & Co	Sitkoh Bay	1
James Robertson	Hawk Inlet	2

Upon the agreement of the trap owners to plead guilty and assume all responsibility for the illegal actions of their employees, the indictments against the latter were quashed. On July 28 and 29 the defendants, either in person or by their attorneys, entered pleas of guilty, and on July 30 the court sentenced them to a fine of $150 for each trap fished illegally. As an offset to the small penalty inflicted (the maximum penalty is a fine of $1,000 and imprisonment at hard labor for ninety days for each offense), the court announced that if any of the defendants were brought before him again on a charge of illegal fishing, he would inflict practically the maximum penalty.

The most reprehensible feature of these violations was that at the time of the second visit (July 11–13) every one of the canneries was glutted, there being an immense run of salmon then on, and but few plants being able to "brail" their traps oftener than two or three times a week; notwithstanding which congested condition, the traps were operating during the closed as well as the open season.

It is a pleasure to record that of the seven owners of traps operated illegally during the closed season of July 4–6, three were found to have their traps closed during the closed season of July 11–13, while one owner had but 1 of his 6 traps partially open, and that in but a technical violation. It is but just also to state that several of the defendant corporations very probably had no knowledge of the illegal procedure of their superintendents, and one, the largest operator in the district, took drastic action by discharging those responsible and sending to its other superintendents a warning that they personally would be held responsible for violations of the law by their men. In a country so thinly settled as Alaska, and where the superintendent of a cannery is so far from his home office, with the direction of everything entirely in his own hands, the large companies find it a difficult, if not impossible, matter to control their subordinates as they could if within easy reach, and whether the men fish legally or illegally is largely dependent upon the superintendent's own personal inclinations. It is to be hoped that the action taken this year will be a lasting benefit to the fisheries.

The most gratifying development of this action was the support and encouragement extended by most of the newspapers and many of the citizens of the district, showing clearly a healthy public sentiment in favor of the enforcement of the fisheries law.

A few complaints were received of the wanton destruction of salmon and other food fishes by certain of the trap owners; but as the complainants were not willing to appear openly in the matter, and the trap men naturally would not commit such a violation while the Department's agents were at hand, nothing could be done. A few of the cannery men do not pack dog salmon, and it is very probable that with their method of emptying their traps but few of these man-

age to get back alive to the water. This is most regrettable, as the dog salmon which are packed in Alaska find a ready sale.

Several complaints were received of Japanese sealers landing on various islands in central and southeast Alaska, where they camped for days at a time, hunting and fishing as they pleased, and destroying seals, salmon, and game when and where they pleased. The revenue cutters devote practically their entire time to Bering Sea, thus leaving the whole of central Alaska at the mercy of marauding craft, and a repetition of the outrage of 1907, when the Indian village of Uguiak, on Alitak Bay, Kadiak Island, was looted by the crew of a Japanese schooner, may occur at any time.

The United States circuit court of appeals at San Francisco this year rendered a decision of great importance to trap fishermen in Alaska and elsewhere on the Pacific coast, setting aside an injunction obtained by two fish-trap locators against the Columbia Canning Company, of Haines. The original claim was that a trap maintained by the latter company at St. Marys Peninsula, on the east shore of Lynn Canal, in navigable waters, effectively "corked" the location staked out by the petitioners, and after trial the judge of the First District Court of Alaska, before whom the action was brought, ordered the company to vacate. The circuit court holds that while the owner or locator of lands in Alaska which border upon navigable or tidal waters has, under the general laws, the right of access to such waters for the purpose of navigation, he can acquire no right or title to the soil below high-water mark, and he can have, therefore, no right of possession upon which he can base an action against an intruder whom he charges with interference and obstruction in the erection and use of a structure upon the shore below such high-water mark.

POLLUTION OF WATERS.

Fishermen in southeast Alaska complain of the dumping of sawdust and other sawmill refuse into the waters, claiming that this drifts for miles in every direction and drives fish away. Unfortunately there is nothing in the fisheries law which can reach this abuse. The natural purity of Alaskan seas and streams has so far been little fouled by the industrial wastes and sewage which pollute the drainage in all thickly-settled regions. As population and manufacturing increases, however, the tendency will be to increased pollution, and the dumping of sawdust and sawmill refuse should therefore be discontinued now. It is everywhere recognized as inimical to fisheries, and its proper disposal imposes little hardship. The United States has a considerable and increasing body of state law on the subject, and the growing sentiment against the practice constantly elevates the standard of public cleanliness in this respect. The very little federal law of this character that exists does not affect state waters,

but in Alaska, where federal authority is supreme and legislation may be uniform for the whole of the wide territory involved, it is in order to take cognizance of questions of pollution at this early day and to look forward to the embodiment in the law of restrictions which will keep the streams and harbors in a condition as closely approaching natural purity as possible. It will be easier to maintain the purity of public waters by legal action than to abate nuisances of pollution after they have become established and confirmed.

WASTE IN PREPARING SALMON BELLIES.

The pickling of salmon bellies as practiced in Alaska has involved the waste of all of each fish save the comparatively thin abdominal wall constituting the so-called "belly." It has not been profitable so far to use the remaining portion, which has been in consequence almost invariably thrown away. The part wasted is greater than the part put on the market, and the total loss from this source during 1907 is calculated as the equivalent of some 2,000,000 pounds of whole salmon. It has been for some time felt that this waste is unjustifiable, and in 1906 the salmon agent recommended that the practice be forbidden when no use was made of the rest of the fish. The Secretary of Commerce and Labor has in fact found such waste to be contrary to existing law, construing section 8 of the Alaska fisheries act of 1906 to distinctly apply to this particular form of waste. Being so notified, the Commissioner of Fisheries, on April 18, 1908, issued the following notice:

NOTICE TO PACKERS OF SALMON IN ALASKA.

It is desired to call the attention of all packers of salmon in Alaska to section 8 of the act for the protection of the fisheries of Alaska, approved June 26, 1906, which reads as follows:

"SEC. 8. That it shall be unlawful for any person, company, or corporation wantonly to waste or destroy salmon or other food fishes taken or caught in any of the waters of Alaska."

The present methods of preparing the bellies of salmon for the market involve the waste of a large part of the edible portion of the fish. It is believed that this waste is contrary to the spirit and letter of the above provision. The Secretary of Commerce and Labor, who is charged with the enforcement of the Alaska fisheries act, has notified this bureau that the practice of curing and preserving the so-called belly of the salmon, which results in the waste of a large proportion of the edible portion of the fish, is a wanton waste within the meaning of section 8 above, and that after January 1, 1909, those who engage in this practice will be reported for prosecution, as provided for in the act.

Packers should especially note that this construction of the law does not forbid the preparing of salmon bellies for the market. It forbids the waste which has usually accompanied their preparation. If the edible remnant is canned or otherwise used or prepared for use as food, the practice is legal.

OBSERVATIONS IN WOOD RIVER.

CLOSING OF STREAMS TO COMMERCIAL FISHING.

In accordance with the order of the Secretary of Commerce and Labor, dated December 19, 1907, Nushagak and Wood rivers, in western Alaska, were closed to commercial fishing. The order was as follows:

To whom it may concern:

A hearing having been given at the Department of Commerce and Labor, beginning December 16, 1907, at which all persons interested in the closing or nonclosing of Wood and Nushagak rivers, Alaska, for fishing purposes were fully heard, due notice of which was given according to law, by virtue of the authority vested in me by section 6 of "An act for the protection and regulation of the fisheries of Alaska," approved June 26, 1906, it is hereby ordered that until further notice Wood River, a tributary of Nushagak Bay, in the district of Alaska, and the region within 500 yards of the mouth of said Wood River be closed to all commercial fishing, and that all commercial fishing be prohibited in Nushagak River proper.

This order becomes effective January 1, 1908.

OSCAR S. STRAUS,
Secretary.

The salmon agent spent the fishing season in the Nushagak and Wood River region for the purpose of enforcing the above order and to pursue the investigations in Wood River detailed below. The boundaries of legal fishing at the mouth of Nushagak River and 500 yards from the mouth of Wood River, as defined by the order, were fixed by surveyors and marked by four large white signs. On each sign a notice of the prohibition was painted in large black letters. By these signs at the mouths of the rivers and by posting copies of the order in appropriate places about all canneries in the region, knowledge of the order was thoroughly promulgated among all concerned.

The enforcement of the order during the fishing season proved a comparatively simple matter. The large run of salmon tended to minimize the temptation to fish in the two rivers, since the fishing was good in the bay, and there were practically no violations. For a large part of the season many boats were on limit, and the daily quota could readily be obtained, the canneries working to their full capacity. Eight canneries were operated on Nushagak Bay and one just above the mouth of Wood River. All of them filled practically all the tin on hand, securing a full pack. In 1907 there were 6 traps in the bay and 6 in Wood River. In 1908 all traps had to be left out of Wood River, but the number in the bay was increased to 11, which represents the total for the region, none having been used in Nushagak River in recent years. Some of the newly located traps were in a very strong tideway where they could with difficulty be maintained at all. Few fish were taken from these, but the traps better located fished well, and some of them were frequently emptied of salmon, since with the

abundant gill-net catch they were furnishing more fish than could be used. There was little need to depend on traps, as the gill nets filled by far the greater part of the pack.

EXPERIMENTAL COUNT OF WOOD RIVER RUN.

As an indirect result of the order closing Wood and Nushagak rivers, a joint investigation of the abundance of red salmon escaping to the spawning grounds through Wood River was undertaken by the Alaska Packers Association, of San Francisco; the Alaska-Portland Packers Association, of Portland, Oreg.; and the United States Bureau of Fisheries. The immediate and specific object was an actual count or accurate estimate of the number of red salmon entering Lake Aleknagik, the first of the Wood River series of lakes, during the season of 1908. An informal agreement was made whereby the two associations should furnish the boats, gear, etc., required in the work of barricading the stream, and the labor necessary throughout the season, while the Bureau, through its representatives, should attend to the tally of salmon. The work was understood on both sides to be an experiment, the outcome of which was fairly doubtful. Despite the occurrence of difficulties both expected and unexpected, the project was carried out much as planned and for the season was brought to a successful conclusion.

The procedure consisted, in brief, of placing a rack of trap web across the foot of Lake Aleknagik, at a constriction in the lake contour something more than 200 yards wide, for the purpose of intercepting all salmon entering the lake and passing them through gates or tunnels at such a rate and in such a manner that an accurate estimate of their numbers could be obtained. In this way a tally was made of 2,600,000 passing up during the period from the earliest arrivals about June 14 until August 10, when the run had dwindled into insignificance. As the accuracy and value of these figures depend on the methods used in obtaining them, a description of the gear and the manner of counting the fish will be given in some detail. The tally was in charge of the salmon agent and Mr. Claudius Wallich, field superintendent of the Bureau of Fisheries. The latter was present at the counting station at the foot of the lake through most of the season and was visited at frequent intervals by the agent. Mr. Wallich devised the method used in counting the salmon during the heavy portion of the run and made the daily tally, temperature records, and many other observations.

Location and construction of the rack.—The selection of a favorable point at which, with a minimum of trouble and expense, to establish the web firmly and compel the salmon to pass in shallow water in plain sight offered some difficulty. The season was one of unusually high water, and the depth and current, therefore, militated against the

easy accomplishment of this object. Where the river in its upper reaches is narrow enough to rack, the current is too swift or the bottom not suitable for driving piles. The river is narrowest at its origin at the foot of Lake Aleknagik. On May 31, 1908, at this point, which is at the Indian village, the width was very nearly 275 feet at high tide. The highest tides affect the level at this point but a few inches, or perhaps a foot, and the differences in the width of the stream due to tidal influence are very small. Seasonal changes, however, make a difference of several feet in the width. This place was expected to be the most feasible for the counting experiments, but when examined on May 31 the depth in the channel was 16 feet and the current 4 to 5 miles an hour. These conditions, in connection with the probable difficulty of driving piles in the hard bottom, led to the abandonment of this site and the selection of the head of the so-called lagoon which constitutes the lower end of the lake. This lagoon is a circular body of water about 1 mile in diameter. Its junction with the main body of the lake makes a comparatively narrow constriction rather more than 200 yards wide, with a greatest depth on May 31 of about 12 feet. The constriction is marked by two distinct gravel spits making out from shore on either side. The rack was placed here and was thus really across the lake at its narrowest point instead of across the river.

On this date, May 31, the lake was almost entirely covered with a layer of greatly honeycombed ice 4 to 6 inches in thickness. The lake was open only for a short distance above the lagoon. The temperature of the lake near the surface in the lagoon was 38° F. at 8 a. m. On June 12 about two-thirds of the lake was open, but the ice still covered all that portion between the main inlet and the head of the lake.

Work was begun June 14 and the pile driving was finished June 16. A somewhat curved line of piles was driven diagonally across the channel from one shore or spit to the other, with the convexity of the curve upstream. Ordinary trap web was hung on the upper side of these piles and anchored to the bottom of the lake by means of a heavy chain running along and lashed to its lower edge. At the north end of the rack and close to the left bank a trap or pot was constructed similar to the pot or pound of a fish trap, but without a web bottom, the web of the sides reaching to the bottom of the water. The trap was somewhat bottle-shaped, about 40 feet long and 25 feet wide, tapering at either end to an entrance and outlet gate, each 4 feet wide. (Both these gates were afterwards modified as a result of experience with the running salmon.) One hundred and forty-five fathoms of web were used in the trap and rack, and this was supported by about 50 piles. At the highest stage the water was 5½ feet deep at the upper end and 6½ feet at the lower.

On June 21 the web had all been hung, but the attachment of the chain had not been finished. The construction or trap crew was taken away and the work finished with the help of native labor, but this was not done without considerable difficulty. In the channel the width of web proved too short to reach bottom by some 3 feet. While the soundings made May 31 and June 11 had shown only 12 feet on a straight course between the two spits, the web was found to be in 18 feet of water in the deepest place. The fact was that the line of piles did not follow the line of soundings but was considerably curved upstream, and the difference was sufficient to add 6 feet to its deepest water. The lack was made up by attaching a strip of web at the top and lowering the whole.

The piles closest to the south shore, at the opposite end from that of the trap, struck either rock or frozen ground, for the first two of them gave way and were found to have their lower ends mushroomed without having penetrated far. One gave way June 21, the other June 23, and their places were taken by cross shear legs cut from the neighboring timber and guyed by lines to the shore. The third pile bent over and had to be strongly guyed. These repairs held the web up efficiently until July 17, when, during an attempt to strengthen the guy ropes, the whole structure of shear legs collapsed and required all hands during the next few hours to repair.

After the rack was supposedly finished it was found that the depth of water made it impossible to tell whether or not, in the deepest places, the chain was securely on bottom and the structure impassable to salmon save by way of the gate. Even in the shallow places it was not easy to see the exact condition of the web and chain, since the slightest ripple on the surface confuses the picture of the object beneath. The current was seen to exert a strong pressure on the web, increased by a certain amount of drift caught by the meshes. Nowhere did the web hang perpendicularly, but between the piles was bellied out downstream by the steady pressure of the current. This tended to lift the chain off the bottom, especially midway between the piles. A crude form of water glass, or submarine telescope, was made by inserting a pane of window glass in the bottom of an empty keg. With the aid of this the bottom could be distinctly seen, in bright sunlight, even in the deepest places, and several places were found through which it was possible for salmon to pass. These were chiefly due to the raising of the chain from bottom, but in a few places holes had been excavated by the current at the base of some of the piles. Closure of all these openings was accomplished chiefly by burlap salt bags filled with gravel. These were sunk on the bights of the web close to or overlying the chain, where by their weight they held the chain in position. They were also dropped into the excavated holes.

Since in several places the chain even at the base of the piles would not remain on bottom, the chain was driven down by long timbers, notched on the lower end and nailed to the pile above water to hold it in place. By these means the salmon rack was made perfectly tight and prevented entirely the passing of the salmon save through the gates provided for the purpose, and by frequent observations with the water glass from the stern of a boat it was seen to remain in this condition.

The web across the channel was for the purpose of stopping the ascent of the fish and at the same time to lead them toward and into the trap at the north shore. This trap was in water shallow enough for all the fish in it to be seen, permitting, therefore, the estimating of fish within the trap or counting them as they passed out. The salmon did not at first lead very readily to the trap, but played about nearer the opposite shore. The entrance to the trap was at first a mere gate 4 feet wide, but as the salmon used this gate to leave the trap as well as to enter it, a tunnel several feet long was attached to it reaching toward the middle of the trap. This effectually prevented the return of any fish. The outlet gate was a rectangular opening about 15½ inches wide, and reaching (July 11) about 3 feet beneath the surface. By the end of the season the fall of the lake level had brought the water almost to the sill of the gate. This gate was provided with a door sliding in grooves, which could be raised or lowered instantly, giving any desired aperture. During the height of the season two simple tunnels were inserted directly in the rack web not far from the trap. These were necessary to release the rapidly increasing numbers of salmon below the web. The tunnels could be readily closed by raising their mouths above water.

The pile driver used in the work was kept at the lake until the end of the season. It was moored close to the gate leading from the trap so that observations on the salmon in the trap and on those passing the gate could be made from the deck of the pile driver. The ark or house scow was moored alongside the trap. This was the living quarters for the attendants. It was close to the pile driver, with which it was connected by foot planks. The tunnels were operated from the deck of the ark.

Method of counting and estimating.—The trap or corral was built with the intention of using it as a basis of estimating numbers. It was intended to let it fill with salmon, close the inlet, and tally out the contents, repeating this one or more times until the observer learned to estimate a trap full with approximate accuracy. Five thousand salmon were found to pretty well fill the trap, but it was not necessary to depend upon this method at all, and it would have proved totally inadequate to dispose of the salmon during the middle of July.

Up to and including the 9th of July all salmon were actually counted. This was done with the aid of tally registers such as are used by the tallymen in counting salmon from the fishing boats into the lighters. All counting was done at the outlet gate of the trap during this time. The inlet tunnel to the trap was kept open almost continuously, and at times during the process of tallying the fish passed directly through the trap without stopping within it. At the bottom of the gate and just outside the sill was placed a board about a foot wide and covered with white cloth to serve as a background against which the dark outlines of the passing salmon could be plainly distinguished. This made the operation of tallying very simple, since every individual fish could be plainly seen, and the stream of fish had only to be so regulated by the gate aperture as not to come too fast to tally.

The first 84,000 salmon were thus counted individually. On July 10, however, the fish massed in such quantities below the web that it was considered inadvisable to hold them back for an individual tally and it became necessary, as was anticipated, to make a basis for a more wholesale count. The method afterwards used as long as the run remained heavy was developed by Mr. Wallich as a logical and natural result of the behavior of the schools of salmon in passing the rack through the gate and tunnel. Contrary to expectation, salmon, even when pressed by hundreds of thousands in the rear, passed the gate in an orderly and almost regular way, and at a rate which decreased or increased gradually and never suddenly. They did not become panic stricken and wedge themselves in the opening, nor otherwise interrupt a fairly uniform flow of fish comparable to the flow of a stream. This uniformity afforded a basis for accurate estimation of numbers without the actual tally of every individual. The method adopted consisted of an actual tally of every individual during a period of one minute, repeated at short regular intervals, as every quarter hour. The number passing during this minute was regarded as the average for fifteen minutes. A sheet with the whole day divided into quarter hours was kept ready at the gate and the number for one minute as taken from the tally register was immediately entered thereon by the attendant who made the tally. From these figures the total for the day was obtained.

This method was checked several times by making the one minute count at more frequent intervals, but no additional accuracy resulted. The method is best applicable to a continuous stream of fish and was mainly used therefor when there was a press of salmon sufficient to keep up an uninterrupted flow. When their numbers became so reduced that they passed out intermittently it was then easy to make an actual tally of all passing, or the outlet gate could be closed until the trap became again well filled with fish. The

great bulk of the run was, of course, estimated on the basis of this quarter-hour tally, since the main part of the run came with a rush. The daily tally for ten days of the season, nine of which were consecutive, was more than 100,000, and on July 14 more than 400,000 passed. This was the greatest number for any one day. During both the earlier and later days of the season the daily run was measured by hundreds, or a very few thousands. During the height of the run the tally could on clear nights be continued until midnight. During these few days when the salmon accumulated in great numbers, faster than they could pass through, the body of fish immediately below the web must have numbered several hundred thousand. Large sections of them, alarmed at some cause or without cause, would occasionally stampede and carry with them a considerable wave lashed into foam, sometimes nearly across the channel, accompanied by a characteristic roar caused by the churning of the water. The fish did not run with entire uniformity throughout the day. They usually dropped back as twilight or darkness approached, and ceased to enter the gate and tunnel for a few hours. Sometimes they would stop entering the trap without apparent reason and pass by it back and forth along the web. In a heavy sea the tunnel swayed somewhat and would not work evenly. The fish prefer a rigid apparatus to pass through.

Accuracy of the count.—The accurate estimation of a large run of salmon such as enters the large rivers of western Alaska was confessedly an experiment, and considerable doubt was felt as to whether it would prove practicable. Not only was it necessary to make a barricade which would certainly prevent the escape of salmon save at the selected gates where the observations were to be made—in itself no inconsiderable undertaking—but the salmon must be led rapidly through these gates, and if not individually counted, at least estimated by some method which commended itself as likely to give a total so closely approximate to the real number as to be as useful as an actual count, and preferably a method in which the result does not depend on the judgment of the observer. Experienced fishermen can judge more or less truly with the eye the number of individuals in schools of fish, but there is error of the personal equation in this judgment where there can be no subsequent count.

Both the requirements referred to were fulfilled in the Wood River investigations. Had the first heavy impulses of the run reached the lake in the latter days of June, an important fraction might have escaped unobserved past the rack, for it had not yet been made a perfect barrier, although even then it delivered most of the arriving fish through the regular gate. A consideration of the dates of the first heavy strike at the mouth of Nushagak Bay, of the first heavy arrivals at Lake Aleknagik, and the known condition of the web, as

shown by the water glass, makes it absolutely certain that the number of salmon passing uncounted to the spawning grounds is not worth considering. The canneries ran lightly until July 1, but on that day the main body of salmon encountered the fishermen at the mouth of the bay. Possibly on the 7th, 8th, and 9th of July, but certainly on the 10th, this run had reached the foot of the lake, as shown by the sudden rise in the daily tally. Even disregarding the tally, it is certain they did not arrive before these dates, for the presence of fish below the web is announced before they pass the gate. They are seen playing along the web, especially at its south end, and breaking the surface all about the lagoon in the vicinity of the rack. The total run of salmon, being a matter of millions, is too large to be materially affected, even if all the salmon arriving before the 10th were ignored; and since long before this the rack was stopping practically all the fish, it is not necessary to correct the total by estimating the error due to fish escaping unobserved. While difficulties were met in making a tight rack in such deep and swift water, they were definitely overcome before the arrival of the redfish run.

The whole run having passed through the gate and tunnels, the count is as accurate as the method used in making it, which method is perfectly adapted to the purpose, and is in a sense automatic. The fish are made to pass at a uniform or slowly varying rate through a given aperture, and the rate measured at regular and frequent intervals of time. This measurement is merely a careful count of the number passing during one minute, and requires only alert care and quickness on the part of the observer. The error of the personal equation of individual judgment is thus eliminated or made a minimum, unless more fish are allowed to pass than can be actually counted during one minute. During a few quarter-hour periods 250 fish per minute were tallied, but usually the gate when wide open would not deliver more than 200 per minute, and each of the tunnels always fewer. It is rather difficult to count satisfactorily more than 200 fish per minute.

The run of salmon may be regarded as having been actually counted and implicit confidence placed in the total. The round number, 2,600,000, is so near the total for the redfish passing into Lake Aleknagik that any difference that exists is not worth considering.

Significance of the figures.—Two million six hundred thousand red salmon passed up Wood River to the spawning grounds, and practically all may be regarded as seed planted for the reproduction of the species. These salmon were part of a large run against which a heavy fishing campaign was made. It would now be of the greatest interest to know just how many red salmon ascended the other

tributaries of the bay. Knowing the catch made by the fishermen, one would then be in possession of important data, viz, the total run entering the single great hydrographic basin, Nushagak Bay with its tributaries, during a season of abundance, and the number which succeeds in escaping the large amount of fishing gear, thus constituting the reproductive quota.

Since Wood River does not carry all the salmon of Nushagak Bay not caught by fishermen, and since no count was made in any of the other rivers, the above totals for the season of 1908 can never be accurately known. It is obvious, however, from a consideration of the conditions that from the Wood River figures alone inferences of importance can be drawn and the figures for both the total run and the breeding quota fixed by estimate within certain limits. It is, for instance, absolutely certain that in 1908 considerably more than 29 per cent of the red-salmon run in Nushagak Bay escaped the fishermen, for the record shows that 6,400,000 were caught, and it is obvious that the 2,600,000 for Wood River does not represent all the fish so escaping.

In order to estimate the total breeding quota for 1908 it is necessary to take into account the other tributaries to Nushagak Bay and to obtain some reasonable basis for arriving at the run in them. Wood River itself affords a basis of comparison. There are three other tributaries of importance in this connection in the following order: Nushagak (or "main" river), Igushik, and Snake.

The Nushagak and Wood rivers are the main streams making Nushagak Bay, the former somewhat the larger, but either of them alone of far more importance than both the minor rivers together. They debouch at the head of the bay and might be presumed to divide the schools of salmon with approximate equality. Nushagak River, however, has not been accounted by fishermen as a great red-salmon stream. For reasons discussed elsewhere, it may nevertheless be accepted as certain that a very important fraction of the run goes up this river, but there is no reason for believing it takes more than half the fish reaching the head of the bay or more than enter Wood River, while there is ground for the argument that the number, while important, is considerably less. Therefore the Wood River quota may be regarded as certainly a maximum for the Nushagak.

While Nushagak and Wood rivers are at the head of the bay, Igushik and Snake occupy the other extreme, entering the bay on the right bank and not far above its mouth. Their mouths are not widely separated. One might argue that being near the entrance to the bay where the schools of salmon are large, they are in a position to receive large portions of the run. On the other hand, this is offset by the fact that, unlike the two big rivers, they are not in the fairway

or on the main route of the ascending salmon. To reach them the fish must diverge from their course, only those following closely the right bank being led naturally into these rivers. Neither river has, or has ever had, a cannery on its banks; Igushik has maintained a saltery, and Snake River has been fished more or less for the bay canneries nearest to it. One cannery some years ago is said to have made its pack chiefly from Snake River, fishing from its mouth to the lake, and securing perhaps some 400,000. Since Igushik is the larger of the two and is known to carry more fish, it is plain that their quota while minor is still too important to ignore. By the most liberal estimate the two rivers together might be held to approach Wood River in the number of red salmon carried. Two million would be such an estimate. We may, therefore, make the following maximum estimate:

Wood River	2,600,000
Nushagak River	2,600,000
Igushik and Snake	2,000,000
Nushagak Bay catch	6,400,000
Total	13,600,000

One may now reduce the figures for Nushagak, Igushik, and Snake so low that it can not on any grounds be reasonably supposed that they are in excess of the actual run escaping in these rivers, and thereby obtain a minimum estimate, as follows:

Wood River	2,600,000
Nushagak	600,000
Igushik and Snake	500,000
Nushagak Bay catch	6,400,000
Total	10,100,000

In each case the catch and Wood River run are the same, being known. By the maximum estimate 13,600,000 red salmon entered Nushagak Bay, of which 52.9 per cent escaped; by the minimum estimate 10,100,000 red salmon entered Nushagak Bay, of which 36.6 per cent escaped. It is reasonably certain that the truth lies within the limits stated.

It is obvious that, in the absence of any previous actual determinations of the runs in any of these rivers, the present count for Wood River gives some general idea of the whole situation, as far as the relation of the catch to the whole run is concerned. Certainly something may be argued from Wood River figures concerning the other rivers. The whole run, the catch, and the breeding quota are each matters of millions of salmon. Of an enormous run a very large number, perhaps one-half, succeed in escaping the fisherman. These first season's results of actual determinations seem amply to justify the undertaking and to furnish information of the most fundamental

and important character. One may see in the figures cited some intimation of the breeding quota necessary to maintain a supply of salmon in the Nushagak region. It is plain that in the years of lighter runs a smaller number escaped than during the season of 1908, and probably a very much smaller number, since a heavy run favors the escape of salmon. Of a smaller run a larger fraction is caught by the fishermen. There has probably been but one larger run since the salmon industry on Nushagak Bay became extensive than that of 1908, if one takes the catch as the index of abundance, and no better criterion is at hand. This was in 1905, when almost 7,000,000 red salmon were taken. The progeny of the 1905 run, however, can hardly be expected to have contributed to the run of 1908, which according to the present evidence of the age of red salmon at maturity is based on the runs of 1902, 1903, and 1904. The following table gives the catch for Nushagak Bay and its tributaries since 1900:

Year.	Red salmon taken.	Year.	Red salmon taken.
1900	4,234,533	1907	2,891,351
1901	5,401,051	1908	6,434,909
1902	4,725,715		
1903	6,319,189	Total	47,780,909
1904	5,345,659		
1905	6,957,819	Average for 9 years	5,308,989
1906	5,470,683		

Even though the larger catches are taken to signify a corresponding large escape to the spawning grounds, this run of 1908 and the present potential abundance of red salmon have probably resulted from a smaller breeding quota than that escaping in 1908, certainly fewer than 7,200,000, perhaps fewer than 3,700,000, and possibly very many fewer than the latter number.

It is futile, of course, to expect to deduce from the available figures the rate of increment numerically. Any calculation of this rate at present involves some important assumptions. It is nevertheless of interest, if not of importance, to see what follows these assumptions. If the maximum estimate of escaping salmon is correct and this number is enough to re-create a run as large as that of 1908, then 6,400,000 is the increase, or increment, and the rate of increase is 88.8 per cent. For the 7,200,000 going to the spawning grounds die immediately after spawning, and they must therefore replace themselves, and 6,400,000 in addition for the fishermen to catch. In this view every salmon leaves finally in its place very nearly two others. In case the minimum estimate is true and the other assumption remains the same, then the relative increment or rate of increase is much higher.

It is only on the supposition that 7,200,000 salmon are inadequate to cause 7,200,000 + 6,400,000, or 13,600,000, to return to Nushagak Bay at the end of the next reproductive period, that a lower increment than 88 per cent may be inferred. It is perhaps conceivable that during the last nine years, in which the average take has been over 5,000,000, varying from nearly 3,000,000 to nearly 7,000,000, a larger average yearly number in some way escaped to breed than in 1908. In this case the increment percentage would be much lowered, the more since this increased escape would have been coincident with, in most years, a decreased catch.

It is, however, difficult to believe that the average spawning escape has been for some years greater than 7,000,000. The assumption that the lesser packs of these years indicate lesser escapes is probably the true one. The cannery operations tend toward a maximum pack under the conditions of each season—a small pack meaning a small run and small escape, a large pack necessarily a large run and probably a large escape. That the escape of 1908 is larger than the average for nine years and larger than that for any single year save 1905 is extremely probable. Unless the ancestral run dates much further back than all experience indicates, it follows from this that the increment of red salmon acting during the past few years may be reasonably inferred to be little, if any, less than 100 per cent, and may be considerably greater.

While this is the trend of the figures at hand, they are not, of course, to be accepted as establishing any general principle. But careful consideration should be given to the possibilities that lie in observations of this sort when they are made sufficiently complete. It would seem certain that their result would in the end be the determination of the natural increment of the red salmon during commercial fishing for the region in question—in other words, the size of the run entering the bay, the minimum number which should be reserved for breeding, and the number which may be taken without injury to the future supply and possibly to its benefit. Fixed within rather wide limits at first, these important and interdependent factors would each year tend to become more accurately fixed. They might finally afford the basis for a practical policy.

Migration movements of salmon in the river.—The red salmon run in the bay may be said to have begun July 1. The first impulses of importance from this run reached the foot of Lake Aleknagik not earlier than July 7 and not later than July 10. It evidently takes a week or ten days for the schools to make the journey from the mouth of the bay to the foot of the lake, a distance of some 50 miles. In the uddy waters of the lower river where the tide ebbs and flows they probably to some extent swim back and forth with the tides. At least they do not make the same progress upstream that they do later when

they reach the clear upper river, where the current almost constantly sets down the river. In the muddy lower portion little can be seen of the salmon save as they break the surface or swim with their dorsals in the air. Not much can be seen here of the general movements of the schools, but in the upper clean water their migrations can be plainly observed.

The ascent of the salmon through the clear water is an interesting phenomenon to view. They do not occupy all portions of the stream. Occasionally stragglers or small schools are encountered in midstream, but the chief movement is confined to the edges and quite close to the banks. Here there is a steady procession of fish, all headed up and proceeding at a leisurely pace, perhaps rather less than 3 miles an hour. They were first observed July 8, when they were probably first forming as a continuous stream corresponding with the head of the run. The column of fish was from 1 to 6 fish wide on each bank of the river, with none or very few individuals farther out in the river. On July 13 a great increase was observed. The column was a dozen fish wide in places, and while there were more individuals in midstream than before, the unbroken procession was confined to a narrow strip of river immediately next shore. They rounded all the points and bends in the river by keeping even closer in toward the bank, where the current was somewhat slower. There was only occasional opportunity to watch the edge of the river during the launch trips up and down, but it is presumed that while the heavy run is on in the river this procession of salmon, several miles long, is continuous day and night, until broken up by the dwindling of the numbers. Even toward the end of the season the stragglers continued to hug the shore. How uniformly the fish in the muddy tidal waters of the river cling to the shore in this formation can not be said. It is probable that no procession exists, or is at least much less well defined. The rate of progress in the upper river, if maintained in the tidal portion, would bring them from the river mouth to the lake in a few hours, whereas they probably spend some days in the river.

Red salmon in Nushagak River.—For the purpose of learning by direct observation something of the abundance of red salmon in the main river, a trip up this river to a distance of about 32 miles, was made July 19 and 20. The river, though wide, is shallow and must be navigated with care and with knowledge of the channel. The water is very muddy in the lower river, but gradually clears as one goes upstream. Just beyond Black Point and above Angel Bay the bottom of gravel and sand was plainly seen in 3 feet of water, but in 6 feet it could not be seen at all. Nowhere did the water become as clear as in the upper reaches of Wood River. There was no proces-

sion of ascending salmon, such as was seen along the edges of upper Wood River. Above Angel Bay the river is broken by islands into several channels, and this condition is said to exist for many miles up the river. Nine hauls with an 80-foot seine were made at points between 25 and 32 miles from the mouth of the river, mostly in the sloughs, which are numerous in this part of the river. Of a total of 193 salmon taken, 52, or 27 per cent, were red salmon. This species occurred in every haul in which salmon were taken. In these hauls 95 humpback, 11 coho, and 35 dog salmon were also taken. One haul contained 122 salmon, and 30 of these were red salmon. The hauls could not be seen in the rather cloudy waters of the sloughs. The main runs of all the species save the red salmon go up the Nushagak River.

The fact that over one-fourth of all the salmon taken in the seine were redfish argues that a considerable run of this species is to be found in this river. When one considers the slight sweep of the small seine used and the chance for the escape of salmon from it as it is slowly drawn ashore, it is seen that the total number of salmon in the many sloughs and channels of the river is probably large. At least these few hauls are sufficient to cast doubt on the opinion held by some fishermen that the main river is to no appreciable extent a red-salmon stream. Moreover, it is reported that the natives at Kakwok and at Tikchik village dry redfish. Tikchik Lake, through Tikchik River, drains into the Nushagak River, and there is no reason in the nature of things why redfish should not seek this lake through Nushagak River as well as the Wood River series of lakes through Wood River. All this evidence goes to show that the red salmon of Nushagak River are not a negligible factor. It is believed that they probably do not equal in numbers those of Wood River, but nevertheless are sufficient to make a very important breeding run.

Every species of Pacific salmon passed through the gate into the lake. Of these, the humpback was most numerous. No record was or could be kept of the exact number, but it was known to a certainty that the presence of this species was only occasional and rare enough to excite comment. When the gate was carefully watched at close quarters, they could be recognized by their spotted backs and smaller size as they emerged, and when so recognized were omitted from the tally. A few were seen spawning or making nests in the immediate vicinity of the ark. The pile driver and ark were constantly surrounded by hundreds of salmon, many individuals seeming to linger there for days. These, as well as those that kept on their travels, were in plain view and the species readily distinguishable. Probably several hundred, perhaps a very few thousand, humpbacks came to the lake, but it is quite impossible that they were any important fraction of the run or more would have been seen. All the other

species were in numbers fewer than the humpback. Note was made of about 16 king salmon, though there were probably more than this. The first king entered the trap on July 23. A few coho and dog salmon occurred toward the end of the season, the latter usually in spawning coloration.

The Dolly Varden trout (so-called "salmon trout") was in some numbers, but the distinct run that was expected from the sea accompanying the salmon to the spawning grounds did not materialize. On July 5, 19 were caught with hook and line from among the salmon in the trap. They ranged from 2 to 6½ pounds in weight. When sea run they were usually in good condition, but those with the late coloration, as most of them were, were more or less diseased and most of them had a distinct emaciation, presumably as a result of the disease. The viscera were largely involved with parasitic cysts, singly and in masses.

A few of the trout were probably counted with the salmon. The total individuals of all species other than red salmon included in the count is insignificant.

Salmon marked by gill-net twine.—As the salmon passed through the gate or the tunnels it was easy not only to recognize those showing the abrasions made by the meshes of the gill nets from which they had escaped, but to count the number so marked and those which had not encountered gill nets, or at least had not been scarred by them. While one observer tallied with the register all the salmon passing, the other counted through the water glass all those showing plainly the characteristic white streaks about the body between the head and dorsal fin. Both counts were, of course, made for exactly the same period. Only those on which the marks were unmistakable were counted as twine-marked. Many salmon struggle through the nets without acquiring scars, or scars heavy enough to be recognized with certainty under the conditions of observations with the fish passing for a few seconds or less in view. The per cent of the total run that has been entangled in the nets and escaped is therefore certainly greater than shown by these counts. On July 3 Mr. Wallich, from an inspection (not a count) of salmon in the trap, concluded that about 1 in 10 were twine-marked. From actual counts on July 7, 60 out of 270, or 22 per cent, were marked; on July 8, 60 out of 235, or 25 per cent; on July 13, 10 out of 130, or 7.7 per cent; on July 17, 32 out of 212, or 15 per cent. Thus when the run is light the percentage of twine-marked fish is high, and when the run is heavy it is low. The counts of July 7 and 8 represent fishing before July 1 in the bay or before the run had struck in; those of July 13 and 17 correspond with the heavy run in the bay.

Young salmon.—On June 12 the redfish fry of the current season's hatching were found in force frequenting the fine gravel beach extending along the mouth of the west shore of the main inlet. They were

playing in schools of various sizes along a considerable stretch of beach to the edge of the ice, which even at that date still covered the whole upper end of the lake above the mouth of the main inlet. All were free-swimming fry whose sacs had only recently become completely absorbed. Many thousands were in sight very close to the beach, so that a few could be taken by wading along shore and scooping quickly at the schools with a dipper. They were too small to be taken in the seine. It seems likely that these fry had been hatched in the next lake above and had been swept down to Lake Aleknagik with the current. On the next visits to this beach in July and August the fry, as was expected, had disappeared.

June 27 Mr. Wallich obtained in one seine haul 70 fine specimens of redfish fingerlings 3 to 4 inches long, on the north shore at the head of the lagoon near the rack. This was also on a gravel beach. A prior haul had been a failure, the successful set being made farther from shore. The individuals were quite uniform in size and were no doubt of the same season's hatching, that of the spring of 1907. They were, therefore, something over 1 year old. These agree with those seen by Dr. C. H. Gilbert, who says:

> * * * At Nushagak, June 3, the young, with parr marks still evident, ranging in size from 95 to 115 mm., were very abundant. These were doubtless descending the rivers to the sea and were probably about 20 months old.

His specimens were about the same size as those taken by Mr. Wallich. These young salmon were migrating, and were not always present about the region where they were taken June 27. July 4 a seine haul was without result, and no signs of their presence could be discovered. The arctic terns, which feed upon them, and which were in abundance June 27, had disappeared. On July 13 in hauls made about a mile above the rack on a favorable gravel beach of an island many adult redfish were taken, but only one young, about 5 inches in length, the largest seen during the season. The same day several hauls on the south shore of the lake near the rack failed to capture any young.

July 23 four distinct schools of fingerling salmon were seen by Mr. Wallich between the pile driver and the shore. These schools contained from 500 to 1,000 fish. A school of at least 1,000 was observed at the same time on the lake side of the ark, near bottom. The fish seemed to be 5 or 6 inches in length. It was Mr. Wallich's opinion that the web across the lake was delaying somewhat the downstream migratory movement of these young salmon.

One lot of redfish fry of the 1907–8 hatch was taken at the foot of the lake near the rack on August 3. They were $1\frac{1}{2}$ to $1\frac{3}{4}$ inches in length. August 4 a good many of the same fry were seen opposite the Indian village at the extreme foot of the lake. Several king salmon about 1 foot in length were caught on hook and line from the ark on August 9.

Weather, temperature, and other observations.—There was said to be more snow on the mountains in the spring than at any time for many years. There was a corresponding heavy run-off with the advance of spring, causing unusually high water in the lake. This increased the difficulties of racking the river or lake, as the gear had to be installed at the highest stage of water. The weather during the summer was unusually pleasant considering the region. There was a maximum of sunshine and a number of successions of several bright clear days. There was no great amount of rain nor many heavy storms, though several good blows occurred, notably on July 17.

There is no appreciable rise and fall of the lake due to ordinary daily tides. At the foot of the lake, however, where the river begins, the effect of the tide is always noticeable in modifying the outflowing current and at the narrowest channel, at the Indian village, marking the origin of the river, each tide probably always making a difference of level. On May 31 high tide nearly made slack water at this point. By July 20 the lake had fallen sufficiently so that even at the rack at the head of the lagoon the high tides slacked the current appreciably. On July 23 a measurement showed that no noticeable rise accompanied the slacking of the current. Navigation of the river to the lake, even with gasoline launches of light draft, must be made on high tide, as there are many shoals to pass. At the end of the season, August 10, the lagoon itself was difficult to pass with a draft of 4 feet. It required the extraordinary high water of a spring tide to get the pile driver and ark out of the lake with the launch, which draws about 4½ feet, at the close of the operations.

From the ark and pile driver at the lake, air and water temperatures were taken from June 14 to August 9, and the fall of the lake level was measured almost daily. The lake must have reached its highest level about June 15, and have held at this point until about June 27, when it began to fall, as shown by a mark placed on one of the piles. The "lake level" record in the table refers to inches below this high-water mark. The fall to August 9 was 43 inches and the lake was still falling when observations were discontinued. Thus a fall of 3½ feet had to be provided for in constructing and locating the gate for the passage of salmon.

Maximum and minimum thermometers gave all the air temperatures. They were placed in a sheltered position on the pile driver. The maximum air temperature observed from June 14 to August 9 was 79°, June 24 and 29; the minimum, 35° on June 20 and 21. The maximum water temperature observed was 56°, the minimum 41°. The water temperatures were taken at the surface with a metal pocket thermometer, from the deck of the ark. The water at this point was subject to rather sudden and unaccountable variations, as shown, for instance, between June 24 and 25. Not far above the ark is a shallow region between an island and the mainland. The

water in these shallows would change its temperature much more rapidly with variations of the air temperature than the main body of the lake. Possibly the variable outflow of these shallows down the lake accounted for the occasional sudden changes.

Coloration of redfish.—During the early part of the season and the height of the run at the lake, salmon were colored like those taken by the fishermen for canning—silvery sides and dark-bluish backs; the color of the back was by no means uniform. An excellent opportunity was afforded to observe their appearance under water as the fish filed through the gate; especially when the floating glass window, made for the purpose, was used, could a clear and unconfused picture be seen. The ground color of the back of the red salmon varied from an almost olive green to darker shades of green and blue almost to black.

Straggling individuals with the distinct red coloration of the spawning season appeared even early in the season, the first recorded in the notes being a male on June 30. At this time the trap contained also several with considerable pinkish color. As the run began to dwindle the number showing spawning colors increased. When the tally ended more than half the few fish passing had turned red. Sixty per cent of all tallied on August 8, and 85 per cent of all on August 9, had taken on the typical red color.

Dead and injured fish.—The web caught all dead fish brought down by the current, and these were from time to time thrown over below the rack in order to relieve the pressure on it. Considerable interest attaches to these salmon, although their death is probably an annual occurrence, made more noticeable by the presence of the rack to intercept them. They were not numerous until the latter part of the season, only one having been found up to July 7. Between July 24 and August 8 more than 1,200 dead were thus picked off the upstream side of the web and thrown below it. They were chiefly red salmon, with some trout and humpbacks, and probably a very few of the other species of salmon. Many of them drifted against the web while still alive, but too weak to stem the current, and in this condition were drowned. Most of these fish had been injured in one way or another before their death, and very many of them were heavily fungused. None of them was spent. Most were unripe females, and a few were ripe males. Many had gill net marks and in some this was the cause of death. In one individual found dead these twine marks had eroded the flesh so deeply that the fish was readily broken in two on the lines of the mark by a slight pressure of the hands.

The origin of the commonest injury, however, is not readily explicable. It is a slough of the skin of the sides of the fish toward the tail, the sore usually extending into the muscles and sometimes deeply even before death, so that the muscle bundles may readily

be separated by bending the tail. These fish were probably dying from disease. The Atlantic salmon in Europe is subject to a disease uniformly characterized by fungus, which was supposed by Huxley to be the cause. Later it was found to be a bacterial disease, the fungus attacks being secondary. It was impossible to make a bacterial examination of the Wood River salmon, but it was difficult to account for the injuries as due alone to external causes. The mortality here referred to has nothing to do with the natural death of salmon after spawning.

While salmon with abraded and bleeding surfaces frequently or usually become fungused, many salmon showed white patches on head or body which resembled fungus while the fish was in the water, but which on close inspection seemed to be merely white areas apparently caused by rubbing against stones on the bottom of the stream. This explanation, however, is not entirely satisfactory, as it is not understood why salmon still green, as many were, should have occasion so far from spawning grounds to perform movements which irritate the skin so extensively. Migrating salmon do not usually permit their bodies to come in contact with any solid surface, not even with each other, provided lack of space does not compel them to crowd together. In the spawning streams they may, of course, mass themselves in intimate contact.

The latter part of July, as the run decreased rapidly, the percentage of fish, which, from their appearance as they passed the gate or tunnels were classed as "injured fish," was seen to be increasing. From July 22 to 26 a tally of such fish was made at intervals, and from 21 to 35 per cent were found to be thus "injured." This tally takes in any fish showing white patches (whether fungused or not), ragged skin, or white or broken snouts.

The injuries to the snout or nose were quite common late in the season and some of these may have been caused by constant jamming of the head into the meshes of the web.

Daily Tally of Red Salmon into Lake Aleknagik during the Summer of 1908.

Date.	Number.	Date.	Number.	Date.	Number.
Prior to July 1	870	July 15	324,300	July 30	6,435
July 1	324	16	219,450	31	6,974
2	309	17	198,915	August 1	1,135
3	4,266	18	129,600	2	704
4	410	19	178,560	3	1,326
5	5,851	20	147,205	4	1,116
6	1,205	21	180,840	5	430
7	10,934	22	61,897	6	1,109
8	22,875	23	68,310	7	560
9	11,000	24	55,275	8	390
10	59,367	25	47,950	9	150
11	120,750	26	23,858	10	70
12	73,650	27	40,380		
13	154,575	28	18,265	Total	2,603,655
14	402,075	29	19,990		

Temperature Record at Salmon Rack at Lake Aleknagik, Alaska, Summer of 1908, in Fahrenheit Degrees.

Date.	Air.			Water.			Air.		Lake level.[a]	Remarks.
	8 a. m.	Noon.	6 p. m.	8 a. m.	Noon.	6 p. m.	Maximum.	Minimum.		
	°	°	°	°	°	°	°	°	*Inches.*	
June 14	....	65	53	41	44	43	69	37	....	Bright sun, light southerly breeze.
15	57	63	60	41.5	43	42	76	37	....	Cloudy, wind in p. m.
16	45	44	46	41	42	41	54	40	....	Rain ¼ inch, cloudy.
17	42	54	52	41	43	44	55	39	....	Cloudy.
18	41	49	54	42	41	43	78	38	....	Cloudy, trace of rain.
19	42	52	68	41	42	42	73	40	....	Cloudy a. m., westerly winds p. m.
20	43	55	64	41	43	44	74	37	....	Cloudy a. m., sun p. m.
21	55	58	65	42	43	45	65	35	....	Bright sun.
22	51	76	65	48	49	45	76	39	....	Do.
23	54	65	68	49	44	45	76	38	....	Do.
24	54	71	59	43	43	47	79	40	....	Do.
25	54	78	70	55	47	52	78	38	....	Do.
26	57	68	65	45	44	49	72	41	....	Cloudy a. m., fair p. m.
27	54	59	67	47	47	49	76	38	....	Bright sun a. m., some clouds p. m.
28	55	59	60	43	50	43	64	42	....	Cloudy.
29	55	79	65	44	45	43	79	42	....	Diffuse sunlight; sultry.
30	52	55	59	46	45	45	64	46	....	Cloudy, trace of rain.
Mean.	50.7	61.7	61.1	44.1	44.4	44.8	....	....	....	
July 1	53	59	59	45	44	44	69	47	3	Southeast wind late p. m., cloudy, trace of rain.
2	50	61	55	43	44	43	65	41	....	Cloudy, rain, trace.
3	49	46	51	44	44	44	57	44	....	Southeast winds p. m., cloudy, rain.
4	45	50	49	43	43	44	54	43	....	Fair late p. m.; rain, ¼ inch a. m.
5	50	59	58	43	46	48	74	43	5½	Fair late p. m.; cloudy a. m., light rain.
6	55	55	59	48	50	51	62	43	7	Cloudy a. m., fair p. m.; cool.
7	46	52	48	49	49	45	61	46	....	Cloudy, trace of rain.
8	44	52	50	48	48	44	62	39	8½	Cloudy, rain, ¼ inch.
9	45	60	59	43	49	45	65	36	10½	Bright sun, showers (trace).
10	49	55	56	44	47	47	61	66	....	Cloudy.
11	47	52	59	47	47	49	65	44	11½	Cloudy a. m., fair p. m.
12	52	58	55	45	45	45	62	39	12	Cloudy a. m.
13	45	55	57	43	44	45	62	42	13½	Cloudy, rain, ¼ inch last night.
14	45	48	60	45	48	50	62	43	15¾	Fair, some clouds.
15	48	55	60	45	45	45	65	46	17½	Cloudy, strong northeast winds, fair p. m.
16	50	50	54	44	46	45	65	43	18½	Clouds, trace of rain.
17	52	61	54	45	44	45	68	44	....	
18	52	52	52	45	45	45	58	40	19½	Clouds, cool, trace of rain, stormy p. m.
19	46	49	43	45	45	45	56	43	19½	Clouds, rain, ¼ inch.
20	44	51	52	44	44	45	56	43	20½	Some sun p. m., clouds, rain, ¼ inch.
21	44	52	55	45	45	43	60	43	21	Clouds, rain, ⅛ inch, some sun p. m.
22	49	56	55	45	46	46	64	45	22	Clouds, rain, 1/16 inch, fair p. m.
23	49	76	70	46	49	50	79	43	23½	Bright sunlight.
24	47	59	55	49	50	50	63	43	25	Fair all day, diffused sunlight.
25	48	52	55	51	51	52	58	48	25	Clouds, rain, ⅜ inch, fair p. m.
26	50	52	....	49	51	....	73	45	26	
27	47	53	57	50	52	53	62	48	27⅓	
28	55	69	67	50	54	55	74	47	29	
29	58	67	63	51	54	56	72	38	29+	
30	44	53	49	54	54	54	58	47	32	
31	45	52	48	53	54	....	58	45	32	
Mean.	48.4	55.5	55.4	46.4	47.6	47.3	....	....	....	

[a] Lake reached high-water level about June 15 and did not begin to fall until June 27. After June 27 readings of "Lake level" give inches below the high-water level.

Temperature Record at Salmon Rack at Lake Aleknagik, Alaska, Summer of 1908, in Fahrenheit Degrees—Continued.

Date.	Air.			Water.			Air.		Lake level.	Remarks.
	8 a. m.	Noon.	6 p. m.	8 a. m.	Noon.	6 p. m.	Maximum.	Minimum.		
	°	°	°	°	°	°	°	°	*Inches.*	
Aug. 1	50	58	55	48	52	52	65	38	33	
2	54	65	58	48	52	53	68	47	35	
3	49	63	58	50	54	54	68	38	37	
4	47	57	53	......	54	54	66	37	38	Fine, bright day.
5	45	46	45	52	49	49	53	45	39	Rain all day.
6	46	54	50	49	53	48	58	44	39	Cloudy, sun in p. m.
7	......	55	52	......	......	......	64	36	40	Fine, clear day.
8	53	58	56	......	......	......	65	49	......	Do.
9	......	62	56	......	53	52	65	......	43	Clear a. m., cloudy p. m
10	52	......	......	......	......	......	......	48	......	

SALMON-MARKING EXPERIMENTS.

Trials have been made with the thermocautery as a means of removing or marking the fins of salmon fry shortly after the absorption of the sac, and the fry have been held and are still under observation. Since the chief question here is that of regeneration of the lost parts, the final determination of the value of this means of marking must be awaited. At present the indications are favorable. Extended trials have been made with a brand of the character of the letter S, burned by means of a thermocautery into the skin of the fry at the stage mentioned above. These marks do not persist even when deeply burned and attempts to obtain in this way a mark for salmon fry which shall be permanent in the adult are therefore failures. It does not follow from these results that such a brand of proper size placed on older fish would not persist as a plain scar of definite form; but the younger fry are the ones for which a practicable mark is the present desideratum, since it is already demonstrated that fingerlings may be successfully marked. Experiments will be continued along the lines already begun.

RETURN OF THE SALMON MARKED AT FORTMANN HATCHERY.

In the 1908 run at Fortmann and Yes Lake hatcheries 5 adult redfish lacking both ventrals were taken at the former and 3 at the latter. These are returns from the Chamberlain marks of the summer of 1903, both ventrals having been completely excised from 1,600 three-months old redfish fry. The return has covered three successive seasons, 1906 to 1908, inclusive, and amounts now, counting only certainly identified specimens, to 23 salmon, or 1.4 per cent of the number marked and liberated. The importance of returns from these marks lies in adding certainty to the identification of

marked fish with those returning, and in the spreading of the return over three successive years and into other waters than the parent stream, rather than in any demonstration of the numerical proportion of fish returning and the consequent effect of similar plants on the general salmon supply. Considering the indeterminate number of incompletely identified salmon taken at Yes Lake in 1906 and supposed to bear this mark, and the returns which have undoubtedly occurred unobserved, it is not well to make much inference concerning the size of the total return, save that the percentage given is certainly a minimum.

It is not improbable that the result of this marking experiment will prolong itself into another season, and more individuals occur in the run of 1909.

EXAMINATION OF SALMON FOR NATURAL MARKS.

The examination of salmon for marks, imperfections, and injuries to the fins, or absence of fins, presumably from natural causes, referred to in the report for 1907, has been continued. This examination is to determine the extent to which natural marks may simulate artificial ones. At a cannery on Nushagak Bay during June and July, 12,700 red salmon were examined with respect to all fins. All the fins are subject to imperfections of one sort or another, the caudal showing most. Fins entirely missing are rare. Of the number cited, only one right and one left ventral, from different individuals, were completely gone, and in no case was the pair of ventrals lacking, as in the artificially marked fish above described. The adipose fin, on the other hand, was missing in 5 of the salmon, or 1 in about 2,500. Besides these, 6 adipose fins were injured or imperfect. In considering the return of salmon marked by the removal of the adipose fin, it is evidently necessary to deduct from the observed return a certain number representing the proportion of adipose fins naturally lost. The larger the number of salmon examined in regions in which artificial marks have not been made the more accurate will be the basis for whatever correction of this nature is necessary. Full data on this subject will be published when the examinations are finished.

Several so-called "marks" were brought to attention during the summer. Three of these were of the same general character—an elliptical or nearly circular mark with milled edge, dotted inside with spots of more or less definite arrangement. These marks are suggestive of the impression of a coin or other artificial die, and readily appeal to the uninitiated as a hatchery mark. A few specimens turn up nearly every year. They are the scars left by the suctorial mouth of the lamprey, probably the common Pacific form (*Entosphenus tridentatus*), with whose oral cusps the impressions generally agree. These scars

are apparently seldom seen on the salmon save about its head, probably because the fish succumbs after the lamprey obtains a secure hold upon its fleshy parts.[a]

THE COD FISHERY.

All of the firms and individuals operating in the district for cod exclusively have their headquarters at San Francisco, Cal., and Seattle, Anacortes, or Tacoma, Wash., at which places or in their immediate vicinity the kench-cured fish are received and prepared for marketing. Most of the operators have shore stations, located at favorable places in central Alaska, from which the dory fishermen carry on their fishery operations, bringing in their catch daily. When sufficient kench-cured fish have accumulated to form a cargo, a vessel is dispatched from the home port, or else a fishing vessel completes its fare from the station catch and carries the fish to the curing establishments on the coast. A small fleet of vessels also visits the banks, mainly in Bering Sea, where safe harbors in which shore stations can be established are few.

A few true cod, known locally as gray cod, are caught in the sounds and straits of southeast Alaska each season; but as they are much smaller than the western cod, and are only taken incidentally in other fisheries, those secured are pickled.

Mr. E. A. Smith, of Seattle, Wash., has invented a method by which the bones of cod are reduced to a pulp and the product put up in hermetically sealed cans. It is the belief of the inventor that the product can be used in making codfish cakes. If this product proves salable, it will furnish a market for a part of the Alaska fish which is at present thrown away.

Early in the season coast prices on codfish broke very sharply, largely because of the impracticability of moving the prepared products after the ruling of the federal authorities against the use of borax as a preservative in shipping. Prices became better a month or two later, however, when it was ruled that borax could be used provided the packers distinctly labeled the packages with directions for the removal of the preservative.

The prejudice in the eastern markets against Pacific cod, traceable largely to the business jealousy of eastern dealers, is rapidly wearing away as the excellent quality of the western product is becoming better known. Frequently in the past when the eastern dealers have been faced with a shortage of cod they have purchased Pacific cod

---

[a] See Rutter, Natural history of the quinnat salmon, Bulletin U. S. Fish Commission, vol. XXII, 1902, p. 120; and Moser, Salmon investigations in 1900, Bulletin U. S. Fish Commission, vol. XXI, 1901, p. 192.

and packed it under eastern labels, and the consumer has been none the wiser.

Shore stations.—During 1908 the following shore stations were operated: By the Alaska Codfish Company, at Company Harbor and Moffat Cove, Sannak Island; Unga, Baralof (Squaw Harbor), and Kelley Rock (Winchester), Unga Island; and Dora Harbor, on Unimak Island. Blom Codfish Company, at Eagle Harbor, on Nagai Island. Pacific States Trading Company, at Northwest Harbor, Little Koniuji Island, and Ikatik, on Unimak Island. Seattle-Alaska Fish Company, at Baralof (Squaw Harbor), on Unga Island. Union Fish Company, at Pirate Cove, Popof Island; Northwest Harbor, Little Koniuji Island; Eagle Harbor and Sanborn Harbor, on Nagai Island; Unga, on Unga Island; Pavlof Harbor and Johnson Harbor, on Sannak Island; and Dora Harbor, on Unimak Island.

Mr. John H. Nilson is building a station at Baralof (Squaw Harbor), Unga Island, and will have it ready to operate in 1909.

The stormy weather of last winter and spring interfered considerably with dory fishing from the stations, but fairly good catches were made after the weather settled, early in the summer.

Statistics.—The table below shows the condition of the industry in 1908. In addition a total of 227 men were occupied in the industry, all in central Alaska, 187 of them fishermen, 27 shoresmen, and 13 transporters.

INVESTMENT IN THE CENTRAL ALASKA COD FISHERIES IN 1908.

Items.	Number.	Value.	Items.	Number.	Value.
Transporting vessels:			Apparatus:		
Launches	1	$6,000	Hand lines		$2,220
Tonnage	7		Trawl lines		600
Sailing	2	7,500	Stations, with accessory property	19	63,200
Tonnage	31				
Boats	289	10,930	Total		90,450

PRODUCTS OF THE CENTRAL ALASKA COD FISHERIES IN 1908.

Products.	Round weight.	Salted weight.	Value.
	Pounds.	*Pounds.*	
Cod, salted	5,354,666	3,766,000	$131,810
Cod, pickled	3,733	2,800	143
Cod tongues, salted		21,800	1,962
Total	5,358,399	3,790,600	133,915

Vessel fishing.—A fleet of 17 vessels, with headquarters in California and Washington, operated in Alaska waters this year, several of them having spent the winter of 1907–8 in the North. The winter and

spring months were unusually stormy, however, and there were long periods when little or no fishing could be done. Early in the spring the rest of the fleet arrived, and until early in June operated in the North Pacific off the Shumagin and Sannak islands. Most of the vessels then entered Bering Sea and fished there the remainder of the season, with a poor catch in June, but very good luck in July. The additions to the Washington fleet this year were the schooner *Vega* (233 net tons), operated by King & Winge Company, of Seattle, and the brig *Harriet G.* (188 net tons), operated by Mr. J. A. Matheson, of Anacortes. The schooner *Carrier Dove* (82 net tons), which has been operated for some years by the Seattle-Alaska Fish Company, of Seattle, did not fish this year. The additions to the California fleet were the schooner *Ivy* (135 net tons), chartered by the Union Fish Company, of San Francisco, and the schooner *Ida McKay* (178 net tons), operated by the Pacific-States Trading Company, of San Francisco.

On September 30, 1907, the schooner *Glen*, belonging to the Pacific-States Trading Company, of San Francisco, was wrecked in Bear Harbor, near Cape Pankof, Unimak Island. In January following the schooner *John F. Miller*, belonging to the same company, visited the wrecked schooner for the purpose of salving as much as possible of her cargo of codfish, and after taking on board a considerable quantity was caught in a storm and, coated with ice and unmanageable, was driven upon the beach and wrecked. Out of her crew of 33 men 10 were frozen to death. It is very probable that both vessels will be a total loss.

These wrecks were the crowning misfortune of the Pacific-States Trading Company, which after several years' struggle for success in the cod fishery this year gave up. In August all its stock of fish on hand and expected to arrive was sold to the Union Fish Company, of San Francisco, which also leased for a term of years the drying plant at Glen Cove, near Vallejo, and the vessels of the company, of which they secured immediate possession, while the stations of the company in Alaska will be taken over on lease in April, 1909.

The schooner *Czarina*, belonging to the Union Fish Company, of San Francisco, lost four of its fishermen early in the summer by the capsizing of their boats.

This year the Robinson Fisheries Company, of Anacortes, very materially increased the pay of its fishermen. Men catching more than 10,000 fish received $30 per thousand; those catching 8,000 and under 10,000, $27.50 per thousand; less than 8,000, $25. No fish less than 28 inches in length was counted.

The vessels from Washington operating in Alaska waters caught 1,103,500 fish, while those from San Francisco caught 805,403, a total

of 1,908,903 fish. In addition, a fleet of 3 San Francisco vessels operated in the Okhotsk Sea and caught 445,000 fish.

THE HALIBUT FISHERY.

This excellent food fish continues to occupy a prominent place in the commercial fisheries of southeast Alaska and would make an even better showing in the statistical tables could the catch of the Puget Sound fleet of sail and power vessels made in local waters be included. Owing to the fact that the fishing grounds of central and western Alaska are too remote for fresh shipments with the present steamship facilities in those sections, the fishery is restricted to southeast Alaska. It is very probable that halibut would be found as abundant in central and western Alaska as in the southeast, if not more so. In winter, when the halibut is chiefly sought, storms are numerous and places of shelter infrequent, so that even in southeast Alaska the fishery is practically restricted to the straits and sounds formed by the numerous islands. Investigation has shown, however, that halibut occur in abundance in the ocean off Chichagoff and Baranof islands, and the mainland between Cape Spencer and Yakutat Bay, and it is extremely probable that other banks would be found if search was made. The dangers of open-sea fishing will doubtless eventually be disregarded, as now in the cod fishery.

During the winter of 1907–8 and the following spring the fishermen made very good catches and received remunerative prices, as high as 6 cents a pound being paid in Seattle at times. All halibut caught in Alaska, except those taken by the large steamers, are shipped to Seattle on the regular steamers plying between the latter place and ports in southeast Alaska, and as most of these shipments occur during the fall, winter, and spring months, when other shipments are light, it is a profitable business for these boats, whose owners make every effort possible to aid the shippers by increasing their facilities as needed.

Early in the summer of 1908 the New England Fish Company, an American corporation which at present operates from Vancouver, British Columbia, began the erection of a large plant at Ketchikan, which it hopes to have in operation early in 1909. It is intended to handle not only halibut, but also salmon, black cod, herring, etc.

The schooner *Petrel*, owned in Juneau, while in Pybus Bay, Admiralty Island, in January, turned turtle during a gale, and the master and one sailor were drowned.

The United States Signal Service has now established a wireless station at Petersburg, bringing this headquarters of the halibut fleet in direct communication with Puget Sound, and obviating the former necessity of sending messages to Wrangell by mail and thence by wire.

But little halibut fishing is carried on in Alaska during the summer months, as halibut is then coming into Puget Sound ports in abundance from the fleet operating off Cape Flattery, Washington, and the fish, moreover, are in the deeper waters, where they are more difficult to catch. The price is low, also, at that time. A few local vessels make short trips and fletch their catch, but the low prices received for fish prepared in this way during the past two years offer little inducement to the enterprise.

A considerable part of the Pacific coast halibut is shipped to points east of the Mississippi River, Chicago, New York, and Boston being the principal distributing centers. The demand from the coast, however, is showing a most healthy growth, and will eventually take the greater part of the catch. Dealers located at Tee Harbor, Hoonah, Juneau, Douglas, Petersburg, Scow Bay, Wrangell, and Ketchikan handle the fish from the fishing boats. Scow Bay, which is on Wrangell Narrows, about 5 miles from its head, is the principal shipping point. Here are moored several large house scows and floats, alongside of which the fishing boats tie up and deliver their catch to be boxed in ice for shipment and put aboard the regular steamers for Seattle, which pass through the Narrows every few days.

In addition to the fleets of power and sail vessels operated by white men from the various ports, Indians in small boats do considerable fishing each season. As they catch salmon during the summer, however, and but few of them can be persuaded to start halibut fishing until the money they have made in salmon fishing has been spent, which is generally not until after the holiday season, they lose two of the best months of the season. They abandon this fishery, moreover, as soon as king salmon become abundant early in the spring. Their own interests suffer by this, as they are better posted than most of the white fishermen as to the location of the smaller fishing banks, and if they would give serious and undivided attention to the halibut during the winter months, their returns would be as great if not more, than they earn during the summer salmon fishing.

Statistics.—During 1908 there were 395 persons employed in all branches of the industry, an apparent decrease of 64 as compared with 1907. The decrease is termed apparent because many of the Indians spent more time fishing for king salmon than for halibut, and have been counted in the former fishery, where the greater results were accomplished. The number of steamers and launches fishing increased 9 over 1907, while the number of sail fishing vessels decreased 1, and the transporters 2. The total investment has more than doubled in value. The catch shows a gain of 1,174,388 pounds and $33,791 over 1907.

PERSONS ENGAGED IN THE ALASKA HALIBUT FISHERIES IN 1908.

Occupation and race.	Number.	Occupation and race.	Number.
Fishermen:		Shoresmen:	
Vessel fisheries—		Whites	19
Whites	175	Japanese	2
Indians	20	Indians	1
Total	195	Total	22
Shore fisheries—		Transporters:	
Whites	53	Whites	18
Indians	102	Indians	5
Total	155	Total	23
Total fishermen	350	Grand total	395

INVESTMENT IN AND PRODUCTS OF THE ALASKA HALIBUT FISHERIES IN 1908.

Items.	Number.	Value.	Items.	Number.	Value.
Fishing vessels:			Boats	100	$12,300
Steamers and launches	24	$92,815	Apparatus:		
Tonnage	259		Vessel fisheries, trawl lines		7,905
Sailing	14	12,300	Shore fisheries, trawl lines		5,355
Tonnage	166		Shore and accessory property		207,550
Transporting vessels:					
Steamers and launches	2	2,600	Total		340,825
Tonnage	11				

Products.	Round weight.	Dressed weight.	Value.
	Pounds.	*Pounds.*	
Halibut, fresh	4,559,427	3,643,542	$144,419
Halibut, frozen	958,360	766,688	25,194
Halibut, fletched	144,219	115,375	4,929
Total	5,662,006	4,525,605	174,542

Puget Sound fishing fleet.—A fleet of Puget Sound power and sail vessels visits southeast Alaska during the months from October to March, when, owing to stormy weather and a scarcity of fish, it is not safe nor profitable to visit the fishing banks near their home ports. This fleet makes its headquarters mainly at Petersburg, at the head of Wrangell Narrows, shipping the catch home from Scow Bay near by via the regular steamship lines. During 1908 it comprised 15 power and 10 sail vessels (a decrease of 5 sail vessels as compared with 1907), with a net tonnage of 387 tons and a value of $50,850. This fleet was manned by 166 men and used 69 dories and $5,860 worth of trawl lines. The catch amounted to 1,527,674 pounds, valued at $59,255, a considerable decrease as compared with 1907. None of the above data is included in the statistical tables of this report.

This fleet is steadily decreasing. Each season more and more of the vessels remain in Alaska for the year, some being put into summer quarters, while others engage in the salmon industry and thus become local vessels.

An ever-increasing fleet of steamers from Puget Sound and British Columbia fishes occasionally in Alaska waters, but it has been found impossible to secure accurate data as to their catch taken in this region. These vessels return to their home ports as soon as a full fare has been secured.

THE HERRING FISHERY.

At times herring were very abundant in southeast Alaska, while in central Alaska nearly every bay in which there is eel grass was filled with them, some of these when packed running 240 fish to the barrel. Owing to the low prices realized for Alaska-cured herring and the high freight charges from central Alaska points, but few were shipped out of the district this year. The only hope, apparently, for the herring fishery in central Alaska is that the codfish men who already have curing stations for handling cod, and a fleet of transporters will take it up, but they will not probably find it attractive at the present unremunerative prices. The establishment of smoke-houses has been suggested, but this would be feasible in central Alaska only if the cod dealers took it up. In southeast Alaska the greater part of the catch is either prepared as fertilizer and oil, or used as bait in the halibut fisheries, but few herring being shipped out of the district for food.

PRODUCTS OF THE ALASKA HERRING FISHERIES IN 1908.

Products.	Southeast Alaska.		Central Alaska.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Herring, fresh, for food........pounds..	....	....	10,000	$300	10,000	$300
Herring, fresh, for bait..........barrels..	3,350	$5,020	....	....	3,350	5,020
Herring, salted, for food...........do....	950	7,070	80	680	1,030	7,750
Herring, salted, for bait...........do....	4,355	10,580	....	....	4,355	10,580
Total.........................	....	22,670	....	980	....	23,650

FERTILIZER AND OILS.

The great desideratum in the fisheries of Alaska at the present time is the invention of a small odorless fertilizer plant, costing not more than $2,500 or $3,000, which can be installed at the various salmon canneries and salteries. The offal, which at present is thrown overboard to pollute the waters, could thus be utilized, and as in an average year the offal from the salmon canneries alone amounts to over 35,000,000 pounds, it is easily to be seen that to save it and turn it into fertilizer and oil would not only net a fair financial return to the canners and prevent an enormous annual wastage, but would also render the waters adjacent to the canneries

more agreeable to the inhabitants of the water as well as to the people on the shore.

The whaling plant of the Tyee Company (described in detail elsewhere in this report) was established primarily to prepare oil and fertilizer from whales, and during 1908 met with very fair success. The only other fertilizer plant operated in 1908 was that of the long-established Alaska Oil and Guano Company, at Killisnoo. During the season, which lasted from June 29 to October 28, the company caught 37,560 barrels of herring and 7,680 barrels of salmon (principally dog and humpback), a large gain over 1907, when 24,800 barrels of herring and 4,900 barrels of salmon were utilized. A very small part of these were salted for food. Two steamers were employed in the fishing. The fertilizer prepared amounted to 935 tons, valued at $30,000, while the oil extracted amounted to 136,500 gallons, valued at $27,000, a large increase over 1907.

THE WHALE FISHERY.

The whaling station of the Tyee Company, at Tyee, in Murder Cove, at the lower end of Admiralty Island, in southeast Alaska, was completed early in 1907, but the delivery of the whaling steamer was delayed by the builders until autumn, when the season was so far advanced that the station was operated but a few weeks in that year. During this period eight whales were taken.

Three species of whales are sought by the whalers from this station, viz: Sulphur bottom (*Balænoptera sulfureus*), finback (*Balænoptera velifera*), and humpback (*Megaptera longimana*).

The sulphur bottom is not only the largest whale found on the coast, but also the largest known mammal, the length of an adult varying from 60 to 100 feet. The origin of this name is not very clear, some authorities stating that it was derived from a yellowish cast to the skin on the lower side of the animal, though specimens seen by the writer appeared the same color all over—a light gray or slate color. During the months from May to September, inclusive, these whales are often found in large numbers close in with the shore. They yield a large quantity of oil, and 800 pounds of baleen, 3 feet long, has been taken from the mouths of various individuals.

The finback, or finner, sometimes called the blue rorqual, approaches the sulphur-bottom whale in length, in some cases measuring 70 feet, but it has not the corresponding bulk. In outward appearance the finback surpasses all the cetaceans and is acknowledged to be the fastest whale that swims. Its back is colored a blue-black, turning to almost white underneath. The flippers are comparatively short, the dorsal fin prominent and situated nearer midway of the animal's back than in the other rorquals. The baleen, about 2 feet 6 inches in some cases, is colored a light bluish

gray, streaked with black. A fair quantity of oil is secured from this whale. In respiration the vaporous breath of the animal passes quickly through its spiracles, the high, narrow spout dissolving very slowly, and when a fresh supply of air is drawn in a sharp and somewhat musical sound is made, which may be heard at a considerable distance and is quite distinguishable from sounds made by other whales of the same genus. The finbacks are very erratic in their movements and the fishery consequently uncertain.

The humpback, the commonest species caught by the shore whalers, is one of the rorquals that roam through every ocean, generally preferring to feed and perform its uncouth gambols near the coast. Short and of ungainly bulk, the humpback is equipped with flippers and flukes seemingly out of all proportion to its body when compared with the other cetaceans, the flukes often measuring 25 feet across. Its under jaw extends forward considerably beyond the upper one. The top of its head is dotted with irregular, rounded bunches, which rise about 1 inch above the surface, each covering nearly 4 square inches of space. The color is black above and white underneath. Marine parasites in the form of very large barnacles are always found upon it in numbers.

The humpback delights in frequenting bays and estuaries along the coast, often going great distances from the open ocean. Its slow motion and other habits render it easy of approach and capture as compared with any of the others. The average length is about 35 feet, 50 feet being a large specimen. The baleen is black and short. The production of oil varies more than in all other whales. Scammon reports having "seen individuals which yielded but 8 or 10 barrels of oil and others as much as 75, the length of the animal varying from 25 to 75 feet. Most of these variations may be attributed to age and sex, as the female with a large cub becomes quite destitute of fat in her covering."[a] Whalemen distinguish this mammal at a considerable distance by its undulating movements.

According to Scammon (p. 45):

> In the mating season they are noted for their amorous antics. At such times their caresses are of the most amusing and novel character, and these performances have doubtless given rise to the fabulous tales of the swordfish and thrasher attacking whales. When lying by the side of each other, the megapteras frequently administer alternate blows with their long fins, which love pats may, on a still day, be heard at a distance of miles. They also rub each other with these same huge and flexible arms, rolling occasionally from side to side, and indulging in other gambols which can be easier imagined than described.

The different species described above all have very small throats, their mouths being fitted with baleen, the fine upper edges of which

[a] The marine mammals of the northwestern coast of North America, by Charles M. Scammon. 4to, 1874, p. 42.

act as a strainer and admit only small articles of food to the throat. A minute species of shrimp, called by whalers "brit" and "bait," forms a major part of their food, these little crustaceans, which are found swimming close to the surface in good weather and sinking deeper when big seas are running, swarming in such quantities as to give the sea in their vicinity a decided pinkish tint. The humpback, however, has a fondness for herring and other small fish, and will chase schools of these close to shore, often going miles up the sounds and straits in southeast Alaska. In feeding upon the "bait" the whale swims round in a huge circle several times among them, causing them to huddle even closer together, then changing his course he charges with wide-open jaws through the school he has thus rounded up, and feasts.

In many ways the operation of a shore whaling station, as this style of plant is called, is quite different from deep-sea whaling as practiced by the whaling fleets for several hundred years past. In the latter, after the whalebone and blubber has been taken from a captured whale the carcass is discarded, the vessels having no facilities for handling any other part of it. At the whaling stations, on the contrary, every portion of the animal is utilized in some way or another.

The station of the Tyee Company is favorably situated for whaling in the waters of Chatham Straits, Frederick Sound, and Stephens Passage, in which large schools of whales congregate at times, while the open ocean is distant but a few hours' steaming.

The company's steamer, *Tyee, jr.*, has the lines of a yacht, is 97.9 feet in length, and 17.7 feet beam. In the extreme bow of the steamer is one of the Svend-Foyn harpoon guns. This gun is heavily constructed throughout and has a bore of 3 inches. The harpoon is a very heavy missile, weighing several hundred pounds. A bomb containing roughly a pound of powder is screwed onto the harpoon, and the latter is then rammed home in the same manner as a shot. Coiled up on the iron plate under the gun muzzle is the "foregoer," made of the best Italian steam tarred hemp, $4\frac{1}{2}$ inches in circumference, one end of which is attached to the harpoon about 18 inches from the point. Attached to the other end of the "foregoer" is one of the main whale lines from the winch, this line being of Russian steam-tarred hemp, about 400 fathoms in length, and of $5\frac{1}{2}$ inches circumference.

Near the top of the masthead is located the lookout barrel, from which point of vantage the lookout can cover considerably more area than a man on the deck would be able to. As soon as a whale is sighted the vessel is run as close to it as possible, and when within range the gun is fired. A time fuse is attached to the bomb on the harpoon, this being ignited by the discharge of the gun, and five

seconds after the discharge the bomb explodes. On the shaft of the harpoon are barbs, which expand on entering the whale, making it next to impossible for the harpoon to be drawn out again.

As soon as struck the whale sounds and goes to the bottom, sometimes striking it with such force as to drive good-sized rocks into its blubber. The animal has immense strength and will at times tow the steamer several miles before beginning to weaken. As soon as the line slackens it is snubbed around a heavy steam winch on the deck just ahead of the bridge, after which the wounded whale is played in much the same manner that a fish is played by the expert angler, a continual strain being kept on him, slacking sometimes to avoid a wild rush, but always reeling in slack at every opportunity. The whalers claim that the whale does his hard fighting for freedom deep down, sometimes sulking for many minutes on the bottom. The strain soon begins to tell on him, his rushes growing shorter and less vicious, and finally he rises to the surface, lashing the water white in his struggle. Should he blow blood when he reaches the surface, the whalers know he is mortally wounded, and wait until he dies, but if he blows clear and is quiet the pram, a peculiar spoon-shaped boat adapted from a Norwegian model, is lowered and rowed alongside and a long lance is driven into him until he blows blood, which shows an internal hemorrhage, from the effects of which he soon expires, rolling over on his back in his last struggles, and then sinking to the bottom.

The line is now rapidly hove in until a heavy strain shows that the slack is in and the weight of the whale is showing, when the line is run through a heavy iron block at the foremast head, this mast being heavily rigged in order to stand the tremendous strain. Fathom by fathom the line comes in until at last the dead body is alongside. A chain is attached around the tail and the winch then heaves the tail out of the water, causing the animal to hang vertically head downward from the bow. The steamer is then forced ahead at full speed, to bring the body to the surface. The lobes of the tail are then severed and brought on board. In order to make the carcass more buoyant air is blown into the abdominal cavity by means of a Westinghouse air pump.

Should the whaler not be ready to return to the station immediately, a buoy, with the ship's flag attached, is secured to the whale, and both allowed to go adrift while the steamer continues its hunt, sometimes as many as three whales being brought in at one time, all with their tails out of the water and hoisted to the bow.

Upon arrival at the station the whales are attached to a buoy in front of the slip, from which a line is taken and the animal hauled into the mouth of the slip between two cribs filled with rocks, which act as guides to keep it centered and at the same time to ballast the

nose of the slip under water at all stages of the tide. A large $1\frac{1}{2}$-inch diameter iron chain is then attached to the tail of the whale and it is hauled out of the water under the "flensing" shed by a powerful steam winch.

As soon as the whale is in place men with long-handled knives commence "flensing;" that is, removing the blubber. This is a layer of fat directly under the skin, covering the whole body like a huge blanket, and varying in thickness from 4 to 7 inches on the whales found in southeast Alaska waters. The men walk from the head toward the tail, cutting long gashes in the blubber as they go, then a steel hook attached to a wire cable is hooked in at the end of a strip, the steam winch heaves in on the wire, and the long strips are peeled off one after another.

As fast as removed these strips of blubber are put into the slicer, or blubber cutter, and chopped into half-inch slices, which are dropped into an endless bucket elevator to be hoisted to the blubber pots, where the oil is tried out by means of steam pipes running through the pots. After the blubber is exhausted in these pots, it is conveyed in a chute to a drainage tank, where the bulk of the water is separated by gravity, and then to the dryer, where, mixed with the residue of the meat, it is turned into guano.

After the blubber is removed from the carcass and the inside fat is taken out by chopping through the ribs, the carcass is hauled up to the carcass platform, which is at right angles to and a few feet higher than the main slip. Here another gang of men remove the meat from the skeleton. This meat, which very much resembles beef both in appearance and flavor and is frequently eaten at the station, is put into pots arranged on both sides of the platform, where it is boiled and the oil extracted from it by acid processes. After the oil has been dipped off from these meat pots, a sluice is opened and the residue is allowed to drop into the chute, where it is run into the drainage tank mentioned above, from thence going into the hot-air dryer with the blubber residue. Here it is made into guano by a drying process which dries the material thoroughly and then shreds it fine, after which it is ready for the market, its value as a fertilizer being very high.

The blubber oil is ready for barreling as soon as it is cold, but the meat oil must be clarified first, to remove the little particles of meat remaining in the liquid. The latter is the darker of the two oils, both before and after clarifying.

The parts of the whale utilized and the products prepared at the station are as follows: Tails, sliced into thin strips, salted, and shipped to Japan, where they are eaten; oil, guano, bone meal (the bones of the whale ground up fine), and finners, or gill bones, the baleen of commerce, although a much inferior grade to that secured from the right,

or bowhead, whale. A glue is also made from the residue of the blubber after boiling, and this is used at the station for coating the insides of the barrels to hold the oil. In addition the company is experimenting with the preparation of a meat extract from the flesh, an entirely new thing, and with the preparation of leather from the skin and stomach wall, while glue has been prepared which it is hoped can be put to commercial use.

If the prejudice against whale meat could be overcome it would prove a most important addition to the larder, in Alaska at least, where fresh meat is difficult to obtain. The tail and adjacent parts and the soft piece under the eye are the choice portions. It is said to have much the flavor and appearance of beef.

A considerable quantity of whalebone is secured each season in the Arctic by shore parties of whites and natives, who kill the whales in the narrow channels between the ice. The whites save only the whalebone, but the natives eat the flesh in addition to saving the bone. This year over 53,000 pounds of whalebone came from these sources.

The fleet whaling in the Arctic Ocean and having its headquarters in San Francisco was composed this year of 8 steamers and 2 sailing schooners. Several of the vessels wintered in the Arctic, the steamer *Karluk* some miles to the eastward of Point Barrow. The ice is reported to have been the worst in years, and owing to this the fleet did not deem it prudent to go to the eastward of the point, all of the whaling being done to the westward, where more open water was to be found. Before the fleet managed to get through Bering Strait into the Arctic the steamer *Wm. Bayliss* was wrecked and became a total loss in Anadir Bay, Siberia. The remaining 7 steamers all returned to their home port in November, having secured 26 whales in all, which netted 39,500 pounds of whalebone. No reports have been received as yet as to the success of the schooners. The quantity brought back in 1907 was 114,500 pounds, but this represented two seasons' work.[a]

Owing to the large stock of whalebone at present on hand and the very slight demand for it, the owners of the Arctic fleet are reported to have agreed not to send the fleet north in 1908, thus giving the holders of the goods a chance to dispose of the present surplus.

AQUATIC FURS.

Beaver.—The beaver is slowly, but surely, approaching extinction in Alaska, being one of the most valuable fur-bearing aquatic animals in the interior waters and most eagerly sought after. With the exception of the belt of barren coast country bordering the Arctic,

---

[a] None of the data in this paragraph appears in the statistical tables of this report.

it is found scattered all over the mainland. At one time it was abundant on the Alaska Peninsula, but at the present time only an occasional specimen comes from there. The Kenai Peninsula produces a few, but the main sources of supply are the mainland of southeast Alaska and the Yukon Valley. A small colony of the animals have their homes near Sea Level, at the head of Thorne Arm, Revillagigedo Island. It is probable that a number of the skins taken in the Norton and Kotzebue sound regions are carried by natives across to Siberia and bartered to the natives there for tame reindeer skins.

Muskrat.—The greater part of the muskrat skins secured by the natives are used by them in making fur clothing, blankets, or robes, and small articles to be sold to the tourists or resident whites, and in barter with other tribes; hence but few usually are shipped out of the territory. The greater part of these come from western Alaska and the Yukon River, but few being caught in southeast and central Alaska.

Land otter.—Of all the aquatic fur-bearing animals this is the most widely distributed in the district, and it is much sought after. In southeast Alaska it is becoming quite scarce, Prince of Wales Island, which used to be the principal source of supply, producing but few now.

Sea otter.—This year but two vessels—the schooner *Everett Hays*, of Unalaska, and schooner *Emma*, of Marzovia—fitted out for sea-otter hunting. The former hunted from May 17 to August 18 and secured 19 skins, while the latter was out forty-five days and secured 6. Both did much better than in 1907, when their combined catches amounted to 8 skins. The industry is a very precarious and uncertain one, owing to the great scarcity of the animals and their increasing wariness and shyness, due to excessive hunting in the past. The weather this season was quite boisterous, and as the sea otter can be hunted only in calm weather, there was a considerable part of the time when no hunting could be carried on. During one period of thirty-eight days only eleven hours were suitable for hunting.

The schooner *Challenge* (formerly owned by Mr. Henry Dirks, of Atka Island), which occasionally engaged in sea-otter hunting around the islands of the Aleutian chain to the westward of Unalaska, has been sold and is now engaged in whaling.

Mr. Charles Rosenberg, who, with his son, patrols a stretch of some 30 miles of beach on the Bering Sea side of Unimak Island in the search for sea otters, secured 3 during the past winter and spring. This is the most cheerless and fatiguing of work, as it must be carried on wholly during stormy weather in the cold winter months. The sea otters, in playing about the moving ice, are sometimes caught and crushed to death, and occasionally the carcass is carried by the waves onto the beach. It is for this the searchers watch.

In addition to the catch shown above, 4 sea otters were killed in various ways, making a total catch by Alaskans of 32 sea otters, an increase of 16 over 1907.

The British Columbia sealing fleet, owing to the success of several vessels of the fleet in 1907, devoted considerable attention to sea-otter hunting this year, the schooner *Thomas F. Bayard*, of Victoria, British Columbia, alone securing 28, the biggest single schooner catch in years. The other vessels of the fleet secured 7, making a total catch for this fleet of 35 skins. As these were secured by foreign vessels they are not included in the statistical tables.

Fur seal.—The shipment of fur-seal skins by the lessees of the Pribilof Islands was 12,466 from St. Paul Island and 2,498 from St. George Island, a total of 14,964 skins for the group. These sold in the London market at an average price of $30 per skin. In addition to the above there were 332 fur-seal skins, valued at $8,350 (price paid to the hunters and not the London price), killed by the Sitka Indians in southeast Alaska, while a mysterious shipment of 134 skins, valued at $2,680, came out of central Alaska, making a total of 466 skins, valued at $11,030, taken by Alaskan natives, which, added to the Pribilof Islands shipment, makes a grand total of 15,430 skins shipped from Alaska.

The pelagic fleet hailing from British Columbia and working on the northern herd was composed of 8 vessels, and its catch amounted to 4,452 skins. The Japanese fleet of 38 vessels operating in Alaskan waters took about 13,197 skins. The Indian canoe catch along the British Columbia coast while the herd was going north amounted to 502 skins.

This year the Bering Sea patrol fleet comprised 1 gunboat and 4 revenue cutters. On July 22 the revenue cutter *Bear* seized the Japanese schooner *Saikai Maru* at a point $2\frac{3}{8}$ miles distant from St. Paul Island. This vessel had 6 of her small boats lowered and the crews of these were actively engaged in killing fur seals between the schooner and the shore near the northeast rookery. When first sighted the vessel was about a mile distant from the shore. A few minutes later the *Bear* also seized the Japanese schooner *Kinsei Maru* within the 3-mile limit. The *Saikai Maru* had a crew of 27 men and the *Kinsei Maru* a crew of 32. The former had 244 sealskins and the latter 416 aboard at the time of the seizure. The captured vessels were taken to Unalaska and later the officers and men were carried to Valdez, where all were tried and convicted at the November term of court, and sentenced each to pay a fine of $600, or in default thereof to serve three hundred days in the Valdez jail. Proceedings for the condemnation of the seized vessels are at present under way.

MISCELLANEOUS AQUATIC PRODUCTS AND RESOURCES.

Hair seals.—This very useful animal is fairly common and quite generally distributed along the coasts of Alaska. To the natives it is very important, as from the flesh and oil is secured a considerable part of their winter food, while the skins are highly prized for covering the kyacks and umiaks (types of boats) and for boot soles, trousers, mittens, clothing bags, and caps, and when cut into strips make a very strong and durable cord. The coast natives barter the flesh, oil, and skins with the interior tribes for reindeer hides and furs. Probably but a small part of the total catch is sold to the white traders, who ship them out of the district. This year 6,472 skins, valued at $3,350, were so shipped.

Walrus.—This enormous mammal, which is not found south of the Bering Sea shore of the Aleutian chain, is now becoming scarce, and practically none are secured south of Bering Strait. The white hunters seek it solely for its ivory tusks, but the natives eat the flesh and put the hide to various domestic uses. A few heads and hides are shipped out each year, principally as natural history specimens.

Black bass (*Sebastodes melanops*).—This species is found scattered along the Pacific side of the district, being, so far as known, most abundant in southeast Alaska, especially around Sitka, where it is sometimes called redfish and red snapper. It is now quite generally eaten, and in most of the towns can be purchased at the markets. It is caught with hook and line, which it takes quite freely.

Black cod (*Anoplopoma fimbria*).—As this fish becomes better known the demand for it increases, not only outside of the district, but also in the local markets. It is not only sold fresh, but it is also frozen and pickled. Nearly all of the catch is made incidentally by the halibut fishermen operating trawls for halibut, and when shipped with the halibut brings as much as the latter.

Capelin (*Mallotus villosus*).—This choice little fish has not become a commercial commodity as yet. It is quite abundant in the coastal waters, especially on the cod banks, where it forms a considerable part of the food of the cod. For about a week in October immense numbers are washed up on the beach in the neighborhood of Sitka, and large numbers are then consumed.

It is reported from Latouche Island, in Prince William Sound, that in May there is a run of small fish which strand upon the beach in large numbers and are gathered and eaten by the natives, who cook numbers of them in a pot at one time. They are also eaten by the whites. No one seems to have a name for this fish, but it is possible that it may be the capelin. The same informant reports a run of fish called locally "bait," which comes in before the herring.

Eulachon (*Thaleichthys pacificus*).—This species, the well-known candlefish, is becoming more popular as a food fish among the whites each season. The natives are the chief consumers of it, however, prizing it highly for its excellent food qualities, while the oil and a grease extracted from the fish are favorite condiments with them. In southeast Alaska some of the catch is pickled and sold. The eulachon has a quite general distribution along the Pacific side and also in Bristol Bay, Bering Sea. It frequents in considerable numbers, but for very short periods of time, the principal rivers along these coasts, and almost invariably appears in May.

Flounders.—In places flounders are extremely abundant, and large quantities are taken in all forms of netting operated for salmon and other fishes. They are usually killed and thrown away, but a few are sold in the markets of southeast Alaska, where they are generally called sole.

Red rock cod (*Sebastodes ruberrimus*) is known from southeast Alaska, where it attains a length of more than two feet and a weight of many pounds. It is a good food fish, its flesh fairly firm and of good flavor, and numbers are marketed each season.

Smelt (*Hypomesus olidus*).—This species is found quite generally distributed in southeast Alaska, but is especially abundant around the mouth of the Stikine River during the winter, while in the fall a large run is found in Wrangell Narrows. But little is known of its abundance and movements in central Alaska. In western Alaska there is a large annual run of smelt in most of the streams, especially the Yukon, where they are of considerable importance as food fish. They generally appear in October and disappear the following June.

Trout.—There are 5 species of trout known from Alaska, namely, steelhead, Dolly Varden, cutthroat, rainbow, and Great Lakes. Of these the Dolly Varden, rainbow, and steelhead are handled commercially, the former being especially abundant in all sections. This season large catches of dwarf Dolly Varden trout were made by anglers in lakes Dewey and Kern, small bodies of water in the mountains overlooking Skagway, so situated that fishes from salt water can not reach them. The former lake is about 150 feet and the latter 2,500 feet above sea level. But few of the Dolly Varden caught were over 6 inches in length. It is reported that dwarf trout are found in three lakes on Latouche Island, in Prince William Sound, and it is probable that they will be found in other lakes as our knowledge extends. Steelheads are found spawning in large numbers in Ketchikan Creek late in May and in June. On September 18 and 19 one of the authors saw several taken with rod and reel in the first large pool above the falls, the pool at the time being full of humpback salmon. One weighed $10\frac{1}{4}$ pounds and measured

$31\frac{3}{4}$ inches in length, while another weighed $7\frac{1}{2}$ pounds and measured 28 inches. Both were females with partly developed eggs. The stomach of the smaller one showed nothing but black slime in it; there was no opportunity to examine the stomach of the larger one. When steelheads first enter the creek in May and June, and while they are below the first falls, they will take a bait. No trout were shipped fresh from the district this year, as the authorities of Washington refuse to permit their sale in that state.

Whitefish (*Coregonus*).—Of this valuable food fish 7 species are reported, mainly from the tributaries of Bering Sea and the Arctic Ocean. A dealer in Wrangell reports having received a shipment of 50 pounds from a point about 30 miles up the Stikine River. They were taken in a seine which was being operated for trout.

Other fishes.—In addition to the above, a number of species are found in the district which form, in some instances, a very important portion of the food supply of the natives, and occasionally of the whites. Among the more important of these may be mentioned the following: Lampreys (*Lampetra aurea*), which are quite abundant on the Yukon River while the latter is still icebound; tomcod or wachna (*Microgadus proximus*), very abundant in the northeast section of Bering Sea; pike (*Esox lucius*); Arctic grayling (*Thymallus signifer*); the inconnu (*Stenodus mackenzii*), a very large fish; burbot or losh (*Lota maculatus*); sculpins (*Cottidæ*); Atka mackerel (*Pleurogrammus monopterygius*), an excellent food fish, with a flavor resembling that of mackerel; blackfish (*Dallia pectoralis*); *Boreogadus saida*, found in the Arctic; Alaska pollock (*Theragra chalcogramma*), an excellent food fish; and sand launce, or lant.

Seaweed.—Seaweed as an article of food has always been popular with the Alaska native. It is usually gathered in the summer, dried, pressed in boxes, and put away for winter use.

The natives at Kake, in southeast Alaska, during the month of May gather it and, mixing it, when moist, with salt, compress it into cakes measuring 1 foot in length, 1 foot in width, and from one-fourth to one-half an inch in thickness. In this condition it will keep for some time. The prepared product is used in making soups and for other culinary purposes. A small trade in these cakes is carried on with other Indian villages.

Crabs.—Crabs are very abundant in southeast and central Alaska, and two species are eaten. In southeast Alaska they are caught in various ways. A Juneau fisherman began using crab pots this year to catch them for market.

Several fishermen from Valdez started a novel industry last winter. They caught 1,500 crabs of an average weight of $2\frac{1}{2}$ pounds each, in Cordova Bay, Prince William Sound, and after freezing them, shipped them to Fairbanks, in the interior, by a horse team and wagon.

During the progress of the journey 500 were sold at the various road houses for 75 cents each. Fairbanks was reached on March 12, where the remaining crabs, 800, were sold at $1 each.

According to Mr. Knyg Johansen, of Ideal Cove, in Dry Straits, the crabs seem to spawn at various times in the year. In 1906 immense numbers were spawning in that neighborhood in September, while in 1907 many spawned in the spring. About the latter part of May, in this year, plenty of immature crabs (about 6 inches in length) were to be seen on the flats in Dry Straits.

Shrimp.—Shrimp are found in many places in southeast, central, and western Alaska, but no commercial use is made of them.

Trepang, or bêche-de-mer.—Large quantities of this product are to be found in southeast Alaska, but, although the prepared article commands a high price in the markets of Asia, no use is made of them in Alaska at present.

Shellfish, etc.—Clams, especially the razor clam, *Machæra patula,* are found in abundance throughout southeast and central Alaska, and have been reported from a few places in western Alaska. It is only in the two former sections that they are put to much use, largely because the consumer is generally compelled to gather his own clams, most of the fishermen considering it beneath their dignity to engage in such work for pay. Large mud clams (probably *Panopea generosa*) have been reported from southeast Alaska.

A native rock oyster has been reported from Sitka, in southeast Alaska, and Latouche Island, in Prince William Sound. Cockles, sometimes called scallops, are to be found in Funter Bay and in Dry Strait, near Wrangell. They are eaten, but are not sold. Mussels are plentiful in many sections, especially along the Aleutian chain, where they form an occasional addition to the natives' larder. The octopus is abundant, and at times is eaten by the natives. Abalones are found near Sitka, and would probably be found elsewhere if sought for. The natives of the Aleutian chain consume large numbers of the sea urchin, which appears to be abundant in that section.

RECOMMENDATIONS.

1. That there be available in Alaskan waters at least three vessels belonging to the department for the use of the Bureau of Fisheries in the salmon inspection. For work in southeast Alaska a comparatively small launch (about 60 feet long, 12 feet beam, and fitted with a 60 horsepower gasoline engine), and for western Alaska a somewhat larger one, would answer the requirements. For the work in central Alaska a much larger vessel is needed, one of at least 100 tons displacement, as the waters in this section are open and storms are frequent.

Under the present conditions it is impossible to do effective inspection work except in a few places in southeast Alaska, where launches for hire are numerous. In the greater part of the district it is impossible to charter a suitable vessel for occasional trips, there being none available. During the season of 1908 the agents of the department were unable to visit important sections of central and western Alaska.

2. That a cod hatchery be established on one of the Shumagin islands, in order to aid in perpetuating this valuable fishery.

O

OYSTER CULTURE EXPERIMENTS AND INVESTIGATIONS IN LOUISIANA

By H. F. MOORE and T. E. B. POPE,

Assistants, United States Bureau of Fisheries.

Bureau of Fisheries Document No. 731.

CONTENTS.

OYSTER CULTURE EXPERIMENTS AND INVESTIGATIONS IN LOUISIANA.

By H. F. Moore and T. E. B. Pope.

PREVIOUS INVESTIGATIONS, RESULTING LEGISLATION AND ITS EFFECTS.

In the winter of 1898 and 1899 the Bureau of Fisheries made a reconnaissance of the oyster beds on the Louisiana coast between Mississippi Sound and Atchafalaya River. The report[a] on this work contained a chart giving with approximate accuracy the location of the oyster beds of a considerable part of St. Bernard Parish and a general description of the beds, not only of that region but of practically the entire oyster-producing area of Louisiana. The coast west of the Atchafalaya was not included, partly for lack of time, but principally because the conditions there appeared to be such as to militate against the development of any considerable oyster industry.

Data were published relating to the salinity of the water, the food, spawning, growth, and enemies of the oyster, the general character of the bottoms, the relative prevalence of freshets and crevasses, and, in general, all factors having a bearing upon oysters and oyster culture.

Some attention was given to the extent of the oyster-planting industry, the methods employed, and the results obtained, but no experiments were made to determine in a definite way the results which could be expected from a systematic endeavor to establish oyster culture on a rational basis and to substitute for the haphazard practices on the natural beds the more reliable methods certain to be followed on planted grounds under private supervision and ownership. Based on the observations, the report included a number of recommendations in regard to the requirements for the conservation, protection, and development of the oyster industry both as to the

[a] Report on the oyster beds of Louisiana, H. F. Moore, Report United States Fish Commission, 1898, p. 45–100.

administration of the public beds and the establishment of private ones.

After several years of agitation and discussion the legislature in 1902 passed a general oyster law based on the recommendations of that report. The law was materially amended in 1904 and 1906, and as it now stands on the statute books it embraces practically in their entirety those recommendations and suggestions.

The effects of the law were almost immediately apparent in the growth of the oyster industry and the increase which it contributed to the state revenues. Prior to its passage jurisdiction over the oyster bottoms was lodged solely in the police juries of the several coastal parishes, with the result that the administration of the laws was contradictory and ineffective. The potential wealth lying concealed beneath the tide waters of the state was not appreciated and the oyster industry was neither protected nor fostered.

The several local bodies having jurisdiction had neither the inclination nor the machinery for an effective administration of the interests committed to their charge. The oyster beds practically all lie in waters remote from the habitations of man, and to police them effectively is a matter of considerable physical difficulty, requiring the use of boats to cruise along the coast constantly. Moreover, the police juries and their executive agents were usually men having but slight coastal connections and interests, and it is not surprising that they were more concerned in parish matters more immediately under their notice and within their experience and understanding.

The fundamental feature of the new law was the creation of a state oyster commission having sole jurisdiction, in oyster and cognate matters, over the entire coast, insuring consistency and uniformity of administration, and endowed with ample police powers to make effective the law and the regulations which it authorizes. The larger resources of the state permit the employment of boats capable of policing the beds during the bad weather of the oyster season, requiring the oystermen to observe the cull laws and other essential regulations which under the older régime were disregarded with impunity.

The next most important feature of the new legislation was the passage of consistent and reasonable provisions for the encouragement and regulation of oyster culture. For those who comply with reasonable requirements this provides, in lieu of the former uncertainty, an assured tenure of sufficient duraton to prove attractive to prospective oyster culturists, and while the restriction upon the acreage (1,000 acres) that may be allotted to any one person is such as to prevent the establishment of a monopoly of the best grounds, it does not prevent the acquisition of an area sufficient to satisfy the

legitimate requirements of a considerable corporation. The rental is $1 per acre for the first fifteen years of the term of the lease and $2 per acre for the succeeding ten years, and in addition there is a tax of 3 cents per barrel ($3\frac{1}{4}$ bushels) on all oysters marketed, whether from the natural reefs or planted beds.[a]

Partly on account of the unusually favorable natural conditions under which the oyster industry is conducted in Louisiana, but largely by reason of the protection which the laws accord to the natural beds and the encouragement which they extend to oyster culture, the oyster fishery of the state has made extraordinary progress since the establishment of the commission. This is illustrated in the following table:

PRODUCTION OF OYSTERS IN LOUISIANA IN RECENT YEARS.

Year.	Product.	Increase per annum.	Year.	Product.	Increase per annum.
	Bushels.	*Per cent.*		*Bushels.*	*Per cent.*
1897	959,190		1905	2,187,000	35
1902	1,198,413	5	1906	2,486,256	14
1903	1,534,000	28	1907	3,035,370	22
1904	1,620,576	6	1908	[a] 3,600,000	[a] 19

[a] About.

In the five years preceding the enactment of the first oyster law the increase in the production, which was mainly from the natural beds, was 20 per cent, while in the first five years following the passage of the act, and after it had been improved and amended, the increase was 154 per cent.

The data for 1897 and 1902 are based upon the canvasses of the Bureau of Fisheries, while those for subsequent years are the quantities upon which were paid the "privilege tax," of which more will be said hereafter.

The increase between 1902 and 1903 can not be definitely accounted for and may possibly be due to a difference in the method of gathering the statistics, but from 1904 onward the increases are in part due to the fostering of new oyster houses and the care of the natural beds, but particularly to the fact that the private oyster bottoms were coming into productiveness. The natural beds of the state still produce in quantity more than the planted beds, but the disparity is yearly becoming less, and in 1908 the value of oysters marketed from planted grounds slightly exceeded that of those derived from the natural beds. The quantity produced exceeded the whole product of the state at the time of the investigation of 1898,

[a] The laws in full may be had by application to the Louisiana Oyster Commission, Maison Blanche Building, New Orleans, La.

and almost equaled the yield from all sources in 1902, when the first comprehensive oyster law was enacted.

The increase in the area of bottoms under leasehold since the enactment of the present laws has been astonishing. The exact area of the leased bottoms of the state at the time of the investigation of 1898 can not be stated, but in Terrebonne Parish there were then on record 32 leases, aggregating about 160 acres. Ten years later, March, 1908, after the new laws had been in force but six years, there were operative in that parish 411 leases, aggregating 5,803 acres. In 1898 the state derived from its oyster lands in Terrebonne Parish not over $80, and the parish not exceeding an equal amount. In 1908 the gross income of the state from the same waters was about $8,900.

From 1885 to 1902, under the parish administration of the oyster fishery, but 521 leases, covering 2,820 acres, had been executed in the entire state and many of them had lapsed at the latter date. In March, 1908, there were in the state 1,692 effective leases, covering 22,135 acres of bottom.

It is interesting to observe that although the state permits one person or corporation to lease a maximum of 1,000 acres, the average leasehold at the present time is but 13 acres. There is apparently no tendency to "acquire a monopoly," which is so much feared by opponents of oyster culture, and while several leases of from 500 to 1,000 acres have been granted, most of the holdings are in 10-acre parcels leased mainly by persons formerly working on the natural beds.

There is no doubt that the average size of the leased beds will increase. The oyster-planting industry of the state is as yet, in large measure, in the more primitive stage. Seed oysters from the natural beds are laid down for a year or less and a small acreage suffices for a considerable product. The inevitable necessity of changing this method to that of planting cultch is beginning to make itself felt, and as under the latter system the oysters will probably be left at least two years on the bottom the requirement of larger holdings will assert itself.

If the oyster industry of the state is to continue to expand in the future as in the past, the sooner this change in methods of culture is established the better for all concerned. Carrying the oysters from crowded natural reefs and bedding them for a few months on private grounds where the conditions are better produces a superior oyster and undoubtedly saves many that would die in the struggle for existence under natural conditions. In that way, properly conducted, transplanting increases both the volume and the value of the oyster product, but the area of the natural beds is fixed as to its maximum, and their ultimate productive capacity is correspondingly

fixed. They can, as a whole, produce but a more or less definite maximum quantity of oysters, and experience in other places has shown that this maximum is soon reached in the development of the fishery, and that thereafter the productiveness of the beds decreases by reason of the intensive fishery which the demands of the markets induce. The natural beds inevitably tend to depletion despite all efforts at their protection.

It can not be definitely stated that the maximum productiveness of the natural beds of Louisiana has yet been attained, but there is reason to believe that this is the fact in some localities. In Terrebonne Parish, according to observations made incidentally during the term of the present experiments, but more especially as shown by the studies made by Mr. L. R. Cary [a] in 1906 and 1907, certain reefs highly productive in 1898 are now depleted or barren, mainly as a result of overfishing.

Whereas at the time of the investigation of 1898 practically all oysters from this parish came directly from the natural reefs, it is stated that the greater part of the product now comes from the planted beds. Most of this product, however, has its prime source in the natural beds, whose oysters are transplanted or bedded for a year or less on the private grounds. By this method of planting the drain on the natural beds is maintained or even accelerated under the present system of granting permits to take unculled oysters for planting purposes.

PERMITS TO TAKE UNCULLED OYSTERS.

Under the laws now in force the oyster commission is empowered to issue special permits to take rough or unculled stock from the public beds for planting purposes, provided the leased bottoms to which they are removed are over 6 miles distant from known natural reefs. This provision was incorporated in the law for the purpose of encouraging the establishment of seed beds on bottoms presumably too far removed from spawning oysters to allow them to receive a natural set of spat on planted cultch, the issuance of the permits being optional with the oyster commission.

It is a common practice for those to whom such permits are issued to take up not only large and small oysters, but quantities of shells also, or, in other words, to remove, bodily, portions of the reefs themselves. The reefs are thus depleted not only of their oysters, but of the bottom to which they are attached, and recuperation is prevented by the loss of the shells which under normal natural conditions furnish the only places for the attachment of fresh generations of young. There is thus reduction in both actual and potential productive-

[a] A preliminary study of the conditions for oyster culture in the waters of Terrebonne Parish, La. Bulletin 9, Gulf Biologic Station, Cameron, La.

ness, and the ultimate result of the policy which permits it is not difficult to see. It must inevitably be the accelerated depletion of the natural beds.

The purpose of the provision is meritorious, but it rarely should be necessary to put it into effect under the conditions obtaining in Louisiana. Outside of Barataria Bay there were very few places suitable for oyster culture which were at the time of the enactment actually more than 6 miles removed from spawning oysters, either natural or planted; and even in that region the planting of brood oysters is no longer necessary, since the establishment of this Bureau's experimental plants and the commercial oyster culture which they have encouraged furnishes an ample supply of spawning oysters.

The authors have received the impression that these permits have been issued rather too generously for the best welfare of the natural beds, for not only have they been granted to practically all applicants, but it is understood that they have been issued to the same persons in consecutive years. Even in cases in which it is necessary or advantageous to grant to a planter permission to take unculled material from the natural beds, the practical end contemplated by the law is served by one permit, which will allow the establishment of a self-perpetuating colony of brood oysters, sufficient for all time, unless destroyed by crevasses, the inroads of enemies, or other accidents. If the oysters do not thrive under the general environment to which they are transplanted, that in itself is evidence that the locality is for some reason ill chosen and additional experiment in the same place is likely to prove futile. If the bottom is to be used merely as a bedding or fattening ground, to be planted with oysters year after year, the issuance of the permits is unnecessary.

The present practice not only injures the natural beds, but it tends to discourage the planting of shells and other cultch, without which the oyster industry of Louisiana can never reach its full productive development. For both reasons it appears advisable that the issuance of these licenses or permits should be restricted and their necessity subjected to stricter scrutiny. In those cases in which permits to take unculled oysters appear desirable the oyster commission may with advantage assume the power, which would appear to be legally within its discretion, to designate the reefs from which such oysters may be taken.

In some cases natural beds are so situated with respect to the sources of supply of fresh water that they are peculiarly liable to damage from freshets and crevasses, their oysters being frequently killed before they have had time to grow to marketable size. Such beds are often prolific spatting grounds, and the only way in which the abundant product of young oysters may be utilized is by using

them as seed for planting on private beds more favorably situated for their growth to commercial maturity.

Other beds are, under natural conditions, of little present value owing to an excessive production of oysters. Year after year there is a heavy set of spat and the beds become so crowded with oysters of all ages that all are poor, ill shaped, and practically worthless. The price which such stock will bring in the markets is so low that the expense of culling is prohibitive, and thousands of barrels of potentially valuable oysters die from starvation, smothering, and crowding.

If not denuded of shells these crowded beds may be improved by a removal of a more or less limited portion of their contents, thus leaving more room and a proportionately greater food supply for the growth of the remainder. The superfluous oysters, if not too old, and, therefore, probably irreparably stunted, serve the purpose of brood and seed stock quite as well as oysters from localities naturally more favorable, the only requisite for the production of well-favored stock of good shape being that the larger clusters be broken into small ones to allow sufficient room for the expansion of the individuals.

It would be desirable if even the culled seed oysters used for bedding purposes were taken largely from those natural beds which do not ordinarily produce fat marketable oysters of the better grades, for if they be of fair shape they will speedily fatten on good bedding grounds however inferior their original condition. This practice would make valuable many oysters which would otherwise remain so poor as to be practically unmarketable, while the oysters of the better beds would be left for the benefit of those who obtain their livelihood directly from the natural reefs.

This restriction as to the source of the seed supply is probably not feasible in its application to those planters who gather culled seed during the regular season, but it would appear applicable to many cases in which special concessions are granted, under section 19 of act 178 of 1906, permitting the fishing of culled oysters, for bedding purposes only, during the month of May. The discretion lodged with the oyster commission in the section cited would appear to convey the power to designate the reefs from which the seed oysters may be obtained. This provision of the law at present applies solely to the waters east of the western boundary of Plaquemines Parish, but it could be extended with profit to other waters of the state, provided that the permits be granted with discrimination and with due regard to the considerations just set forth.

The foregoing discussion concerns, principally, the conservation of the natural reefs. There are, in addition, several highly important suggestions relating to the future welfare of the planted beds.

SUGGESTIONS CONCERNING SURVEYS.

The first of these applies to the manner of making and recording the surveys of leased bottom and is made with a full understanding of the great difficulties confronting the surveyors in the conduct of their work. The oyster regions of the state are almost wholly in an intricate system of bays and bayous lying in the midst of a flat and topographically featureless expanse of salt marsh and prairie. The land is rarely more than a foot or two above high-water mark and is almost devoid of trees and conspicuous distinctive marks of any kind. For a large part of the area there are no even approximately satisfactory maps or charts. The work of the United States Coast and Geodetic Survey has been confined almost entirely to the outer coast, which alone is of importance from a viewpoint of navigation, although in a few places, as in the St. Bernard marshes, Barataria Bay, and, more recently, in Terrebonne Bay, the work has been carried some distance inland. Many bodies of water of more or less importance in the oyster industry are not shown on any maps published, many others are so incorrectly laid down as to be practically or absolutely unrecognizable, and on some maps there are shown bodies of water which do not exist.

Confronted by these serious difficulties, the lack of comprehensive surveys and authentic maps, and the paucity of conspicuous permanent landmarks, the surveyors in many cases have been at a loss to prepare plats of much value as matters of permanent record. The corner marks of the leaseholds are frail stakes standing in the water, where they are subject to the erosions of destructive marine organisms and dislodgment by gales and collisions with passing boats. They must be frequently replaced, and are of no value as final points of reference.

In the great majority of cases important corners can be "tied up" to no permanent natural objects, and they are located with respect to bearings and angles taken to tangents of points of land. As is well known to those familiar with the region, many of these points are so similar to one another that it is difficult to recognize the descriptions and, moreover, they are undergoing constant erosion from the waves. Narrow strips of land are converted first into islands and then eventually disappear entirely and within a few years may become absolutely useless for topographical reference. At the present time, with the leaseholds comparatively few and generally more or less isolated from one another, the matter is not of grave immediate importance, the chief desideratum of confining the lessee to an area no greater than that to which he is entitled being easily attained. The nice location of a man's 10 or 20 acres is of little present moment, provided that he pays the rental on the full area occupied.

If, however, the oyster-planting industry of the state assumes the ultimate magnitude to which the natural advantages entitle it, the defects in the surveys will lead to endless trouble and dispute. The best bottom will be in demand, the leaseholds will become congested in favorable localities, and their boundaries will have to be jealously guarded, especially when the bottoms hold a valuable crop. Should the grounds become as valuable as some of those in Rhode Island, for instance, the matter of their exact location will assume importance, and in the controversies that are sure to arise between adjoining lessees on account of the necessarily impermanent nature of the water boundary marks it will be highly essential to have for final reference and adjudication permanent landmarks which can not be questioned. With the surveys as now made and platted the time will come when neither surveyor, judge, nor jury can intelligently pass on some of the controversies that may arise.

The theoretically correct solution of this prospective difficulty would be a topographical survey of the oyster regions, with permanent "monuments" at all, or at least the important, triangulation stations. The whole system of leaseholds could then be brought into relationship and the danger of overlapping and conflicting grants would be eliminated. The water corners would be trigonometrically referred to the established landmarks and the controverted boundaries could be at any time readily redetermined. A survey of this character would be expensive, but if properly made it would have enduring value. The survey of the Maryland oyster grounds now being made through the cooperation of the federal and state governments will be available for all time, with occasional replacement of displaced or destroyed triangulation monuments. In the development of the oyster industry its value will yearly grow more apparent.

In the absence of an elaborate survey such as that outlined, something of permanence could be given to the present surveys if they were correlated with durable landmarks established in the marshes. Drain tiles, sunk for the greater part of their depth and filled with concrete, appropriately marked at the top, located at sufficient distances from the shore to reduce their liability to being washed away, would make excellent marks if they were included in the plats of the survey. From time to time, as they became more generally distributed, the different groups could be connected by triangulation and eventually cut in with the accurately established triangulation stations of the Coast Survey. This would result in the gradual establishment of a chart of the most important oyster-culture regions and give some permanence to the surveys of the individual holdings. It would require the expenditure of some additional labor and care on the part of the field surveyors and general supervision by the engineer of the commission. The slight additional cost of the sur-

veys over the present charges should be borne by the state rather than by the lessee, and in the interest of the future some of the surplus revenue of the oyster commission could be well devoted to such work.

That the difficulty of lack of accurate charting is not an imaginary one is shown by the experience of other states. In Maryland there have been found plats and descriptions of leased oyster bottom which were absolutely impossible of recognition, and to confirm the grants as required under recent legislative enactment it was necessary to run new lines arbitrarily. When Connecticut took charge of the oyster grounds of Long Island Sound the same difficulty was encountered. Many of the leaseholds could not be located from the surveys, and much time and money was expended in reconciling, usually by compromise, the conflicting claims of adjoining lessees. Recently Delaware, with its comparatively small area of leased bottoms and well-surveyed shores, has been compelled to admit that the leaseholds can not be located from the descriptions, and has undertaken an accurate triangulation, the establishment of permanent reference marks, and a resurvey of the whole area of leased bottom. Louisiana's oyster industry is younger than those of the states mentioned, and conflicts and uncertainties in the location of private holdings have not yet become pressing, but in view of the astonishing development of oyster planting in the state the time is not distant when the matter will become of commanding importance.

EXPERIMENTS IN OYSTER CULTURE.

Mention has been made previously of the methods of oyster culture in Louisiana and the comparative insignificance, at present, of cultch planting. The advantages, disadvantages, and ultimate limitation of seed planting, unsupplemented by the other method, have been briefly indicated.

The planting of seed oysters from the natural beds owed its preponderance originally to the ease with which the stock could be obtained and the controlling difficulty of obtaining shells and other cultch, but at present it can be explained in many places solely by that conservatism of the planters which inhibits their departure from a known method to adopt one with which they are not familiar.

In the region east of the Mississippi River the supply of seed on the natural reefs is still large, and in many cases the beds produce oysters which are fit only for that purpose or for canning. This is particularly true of California Bay and contiguous waters in Plaquemines Parish.

West of the Mississippi the conditions are wholly different. In Plaquemines, Jefferson, and Lafourche parishes there are practically no natural beds, and for many years there have been none from which

any considerable supply of seed could be obtained. At the time of the examination of 1898 the beds on the east side of Timbalier Bay, in Lafourche Parish, were approaching exhaustion and they are now negligible commercially. In Terrebonne Parish many of the natural beds existing in 1898 have practically disappeared, and most of the others have become depleted to an extent that makes the procuring of a sufficient supply of seed a grave problem with the planters. Terrebonne Parish formerly supplied the seed for most of the planting beds of Plaquemines Parish west of the Mississippi River, but the supply now comes wholly from the beds east of the river. The seed oysters planted in Jefferson Parish come from the same source, the time consumed in going to and returning from the seed beds often being equal to that required to tong a cargo. It is evident, therefore, that the experience of Louisiana will be like that of other oyster-producing states, where a dependence for seed upon the natural beds eventually produced a scarcity which more or less seriously interfered with the growth of oyster culture.

Louisiana, however, has a material advantage over most northern states in this, that almost absolute dependence can be placed upon procuring a set of spat every year, provided proper materials are supplied as cultch. It was to demonstrate these facts and to determine the possibilities of this method of oyster culture in several parts of the Louisiana coast that the following experiments were conducted by the Bureau of Fisheries at the request of the state oyster commission.

Work was begun in November, 1905, when the senior author made an inspection of the coast as far west as Terrebonne Bay and selected locations for the experimental work. It was determined to begin the investigations at Three-mile Bayou and Falsemouth Bay in St. Bernard Parish, at Tambour Bay and near the mouth of Bayou St. Denis in Jefferson Parish, and at Seabreeze, in Terrebonne Bay, close to a cut-off leading into Bayou Terrebonne. At this time there were no known natural beds in Jefferson Parish, and to supply breeding oysters for the experiments the Louisiana Oyster Commission in January, 1906, deposited about 50 barrels of unculled stock each at Tambour Bay and Bayou St. Denis. The other sites selected were in proximity to oyster beds and the deposit of brood oysters was unnecessary.

JEFFERSON PARISH.

That the southern half of Barataria Bay was formerly a productive oyster region is attested by the statements of the inhabitants and the great bank of shells on the former site of the packing house, but the beds were exterminated by overfishing, probably coupled with natural causes, and at the time of the investigation of 1898

they were recognizable only by the presence of old shells more or less buried in the mud. In a few places there were occasional old oysters, but no spat whatever. None of the natural beds appear to have been extensive, and their extermination was readily accomplished by the reckless methods employed in the fishery, particularly under the changes in the salinity conditions which were then in progress.

A few oysters for local use were annually planted close to Grand Isle and at Grand Bank, and in Bay Coquille some were bedded for market, but in neither place was there any indication of a volunteer growth of young.

There was no evidence of the existence of beds at any time in the upper part of the bay, and persons familiar with the region stated that none had ever been known north of the Quartelle, a group of four small islands near the center of Grand Lake. About 1903 a small bed was found near Bayou St. Denis, but this was quickly depleted and a careful search in 1905 failed to disclose any oysters whatever on its site.

In 1898 the whole upper part of the bay was of low salinity, and it was stated that during spring and early summer the water was often nearly or quite fresh for months, and it was manifest that the conditions were not favorable for oyster growth. With the improvement of the levee system the volume of fresh water discharging into the bay has markedly decreased, and the general salinity of the whole region has correspondingly increased. The closure of the head of Bayou Lafourche has had a very marked influence in Bay Coquille and contiguous waters, where the density of 1.0038 observed in March, 1898, has increased to an average of about 1.0186 during the same season of recent years, and at Leeville, immediately on the bayou, where the water was formerly always fresh, a set of oysters has several times occurred. In Bay Tambour the observed density in March, 1898, was 1.0094, while the average for approximately the same season in 1906 to 1908 was 1.0151. In Bay des Islettes there is noticeable a slight rise in salinity, but nearer the sea, as at Grand Isle, there appears to be little or no change.

Nearer the mouths of Grand Bayou and Bayou St. Denis we have no early data concerning the saltness of the water, though it was stated in 1898 to be almost constantly fresh. During a crevasse in the spring of 1907, when the conditions were such as frequently, if not normally, existed in former times, this water was practically fresh for a considerable period, though the average density during other recent years has been about 1.0110. Little Lake, about 10 miles inland from the mouths of the bayous, where the water was formerly fresh and inhabited by large-mouth black bass, now contains oysters, undoubtedly derived from fry discharged from the experimental beds at the mouth of Bayou St. Denis.

It is evident, therefore, that the zone of water favorable for oyster growth, and especially for the welfare of the spat, has moved generally inland during recent years, owing to artificial changes in the drainage system resulting from levee improvements. We have made the same observations in Terrebonne Parish, where oysters are established in bayous which formerly carried water fresh at all times.

The region nearer the coast is not so salt as of itself to inhibit the growth of oysters, but it has become sufficiently so to be especially favorable for the development of a very destructive enemy of the oyster, the snail or borer, *Purpura*, which kills the spat, though the adults are immune by reason of their heavy shells. On the other hand, the more inland waters have become sufficiently salt for the oyster, but are still too fresh to furnish the environment required by the borer. Of the two localities in which experiments were conducted in Barataria Bay, Bay Tambour falls within the first region and Bayou St. Denis in the second. In Bay Tambour, where natural beds existed until exterminated a number of years ago by overfishing, possibly supplemented by changes in salinity, the set on the experimental beds was as heavy as at Bayou St. Denis, though the spat were killed by borers within a month or two. The adult oysters were unharmed, and at Bayou St. Denis neither young nor adults were molested and no borers were found.

It is evident from the details of the experiments hereafter recounted that practically the entire bay may be utilized for oyster culture wherever suitable bottom can be found or made. North of a line running from the mouth of Bay Baptiste to about the mouth of Bayou du Fone shells and other cultch may be planted with very little risk of having the spat killed by borers and with every assurance that a strike will occur each season. This part of the bay covers about 8,000 to 10,000 acres. Though the bottom was not tested over much of this area it is probable that a considerable part of it is too soft for use without special preparation, though most of it will doubtless be utilized eventually.

South of the line above mentioned is a region, embracing the greater part of the bay, where spat culture can not be attempted without considerable risk or, usually, the certainty of meeting disaster through the depredations of the borer. In some localities the drumfish is likely to prove destructive, but where this danger does not occur oysters not less than $1\frac{1}{2}$ or 2 inches long can be planted with the surety that they will grow into fine stock, commanding a good price in the New Orleans market.

Before the experiments were begun there was some objection to the selection of Barataria as a field of operations, on the ground that there was no industry at that place which could be benefited, and that

the time and effort necessary could be expended to better advantage elsewhere. The answer to this objection was obvious, as the purpose of the work was to develop an industry where none existed, and not merely to supplement what had been already begun. The vindication of the selection was apparent before the experiments were a year old, and the commercial response to the experimental results was immediate.

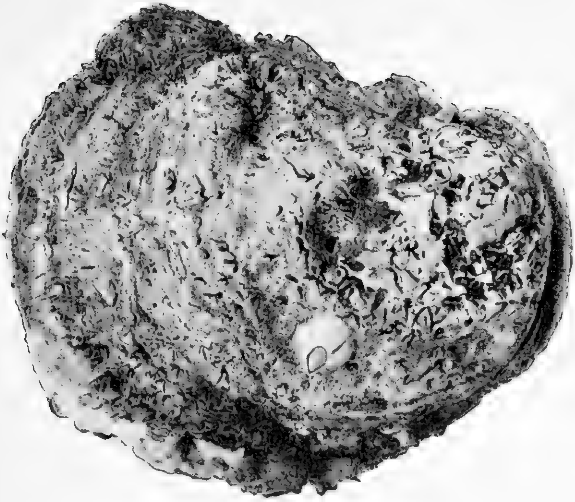
Prior to the beginning of the experiments there had been issued in Jefferson Parish, which includes the waters under discussion, 7 leases, aggregating 75 acres, and of these 4 had lapsed. From the time the early results of the experiments first became known until April, 1908, there were issued 138 leases, covering 710 acres, yielding to the state an immediate annual income of $1 per acre, and the leases immediately surrounding the small experimental plant at Bayou St. Denis so hemmed it in that it was necessary to go on private bottoms in order to carry on the final stages of the work.

Many of these leaseholds have not yet become productive, but during the year ended April 1, 1909, there were shipped from Barataria Bay 29,874 barrels (97,090 bushels) of oysters, valued at $1.60 per barrel on the beds, and paying 40 cents per barrel transportation charges to New Orleans. Practically before the experiments were concluded this region, hitherto producing nothing, was yielding to the state an annual income of $906.22 for rentals and $896.22 for the privilege tax of 3 cents per barrel, a total of $1,804.22 per annum. A more important phase of the results is that the planters during the same year received an income of $47,798.40 and the transportation companies $11,949.60, a total of $59,748. Men formerly in debt have become independent, working no harder than they previously did as farmers or fishermen.

Viewed from the standpoint of the consumer, the results of the work have been equally significant, adding to the state's food supply oysters enough to furnish 600,000 meals of 1 pound each. The region has excellent possibilities, and the oyster industry should undergo great expansion during the next few years. The oysters are of fine quality, fat and shapely, and in 1899 found a steady market when the product of the natural reefs went begging at one-fourth the price.

BAYOU ST. DENIS.

This experimental plant is located in Barataria Bay, about one-third mile from the mouth of Bayou St. Denis, on the edge of an old reef of dead clam shells, in about 6 feet of water. It was selected as being outside of the limits of the old oyster growth, and well adapted to test the validity of the opinion that the upper part of the bay had become adapted to the growth of oysters, and that no place



OYSTERS, AVERAGE SIZE, 1 AND 2 YEARS OLD RESPECTIVELY, GROWN ON OYSTER SHELLS AT BAYOU ST. DENIS, LOUISIANA.

[Figures natural size.]

on the coast of Louisiana offered superior advantages for oyster culture. The currents are strong, both on the experimental beds and for a considerable distance in all directions on average tides at half ebb and half flood, ranging from about two-thirds to 1 mile per hour. This insures a good circulation of water, the frequent renewal of the food supply, and the practical certainty of a good set of spat upon material exposed at the proper season.

The specific gravity of the water, which is a measure of its salinity, ranged from 1.002 during the crevasse of 1907 to 1.017, or, in other words, from practically fresh water to that which was essentially a mixture of two parts of sea water to one of fresh. The average for the whole period of the experiment was 1.009, or, if we exclude the period of the crevasse, it was about 1.012. This salinity, which appears to be maintained quite uniformly during the oyster-shipping season, is well adapted to producing oysters of excellent flavor for "counter stock."

Prior to the experiment it had been feared that in case of a crevasse discharging through any of the bayous opening into the head of the bay the water would become so fresh as to kill the oysters planted on this bed. In the spring of 1907 the levees broke at Live Oak and a great volume of river water coursed down Bayou St. Denis, and especially Grand Bayou, keeping the water on the experimental beds almost fresh during most of May and June. The only effect was practically to prevent a set of spat during these months, the adult oysters being unharmed. This was a rather severe test, and it demonstrates that but little or no harm is likely to occur from ordinary crevasses discharging into the drainage basins of bayous opening into the head of the bay, and that unless the freshet should continue as late as September the set of young would not be prevented.

The bottom in this vicinity is moderately hard, owing principally to the large numbers of clam shells embedded in the mud. Over an area of several hundred acres surrounding the experimental plant the bottom is in many places more or less devoid of buried shells and somewhat softer, but well within the limits suitable for oyster culture. Still farther removed from the experimental plant the character of the bottom is unknown, but there is probably a considerable area immediately available and undoubtedly much more that a moderate coating of shells would make suitable.

With use all of this area would soon become harder from the collection of shells in and on the mud, and eventually would present characteristics similar to those found on the younger natural reefs. This phenomenon is well known to planters and oyster men, and it is a common practice in Louisiana to "shell" the bottom so as to establish on the soft mud a suitable foundation for the deposit of oysters pending the collection of a full cargo for market.

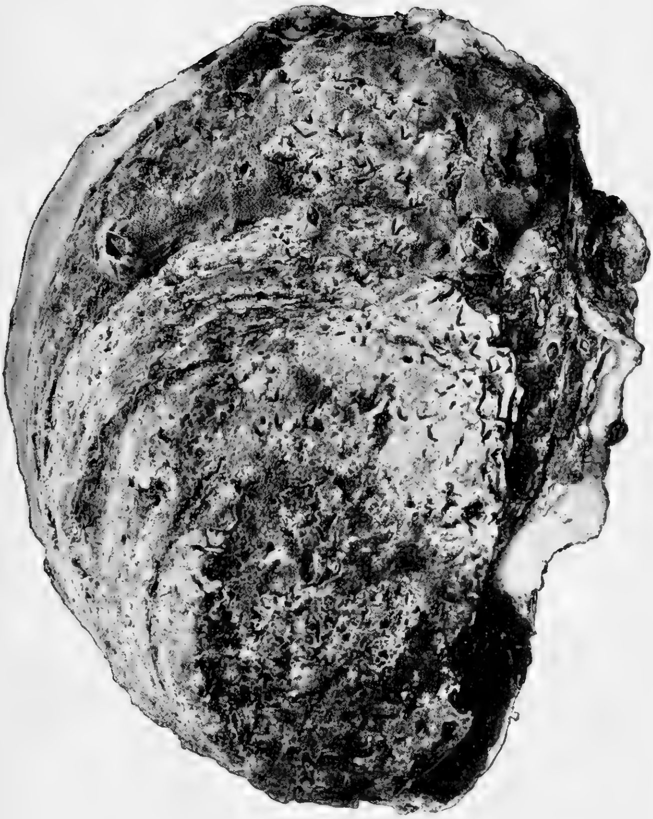
The observations made in this locality during a period of three years indicate an abundance of food, and the strong currents already mentioned assure its distribution over a wide area. Oyster food is more abundant in this locality than at any other of the 40 stations at which observations were made, excepting only the middle of Barataria Bay and Falsemouth Bay. The following table shows the details of the data relating to the observations on the organisms which constitute the greater part of the oyster's food, together with the salinities and temperatures of the water at the time the specimens were taken.

FOOD CONTENT, SPECIFIC GRAVITY, AND TEMPERATURE OF WATER AT BAYOU ST. DENIS.

Date.	Specific gravity.	Temperature.	Food organisms per liter of water.	
			Number.	Volume.
1906.		°F.		Cu. mm.
April 24	1.0066	74.3	10,000	0.160
26	1.0081	77	14,000	.308
May 25	1.0114	79.7	13,000	.189
28	1.0115	83.3	12,000	.352
June 28	1.0115	77.9	18,000	.126
November 5	1.0170	68.0	7,800	.140
1907.				
January 8	1.0128	74.0	3,000	.153
March 16	1.0010	70.0	5,600	.301
April 15	1.0105	73	24,000	1.321
16	1.0126	72.5	21,000	.979
29	1.0095	80.0	6,300	.369
May 21	1.0021	79.0	3,500	.163
June 25	1.0028	84.0	8,000	.206
27	1.0028	84	7,350	.346
December 11	1.0060	55	5,000	.190
1908.				
May 27	1.0105	86	4,200	.163
29	1.0106	85	8,250	.318
July 7	1.0099	83	12,750	.346
1909.				
January 27	1.0133	72	9,000	.280
Average	1.0090	....	10,145	.337

During the period of three years in which the work continued no oyster enemies were observed on the plantation excepting a growth of mussels which appeared during the freshet of 1907 but disappeared later when the salinity of the water became higher.

The experiment began in January, 1906, when the Louisiana Oyster Commission, at the request of the Bureau, planted about 50 barrels of unculled oysters to serve as brood stock. On April 24 and 26 following, the first cultch was planted on three areas, each one-twentieth of an acre in extent, 50 bushels of material being deposited on each. On one square oyster shells were spread broadcast, on another they were deposited in heaps of 2 bushels each, and the third was planted with clam shells broadcast. On May 25 and June 28 the operations



OYSTER, AVERAGE SIZE, 33 MONTHS OLD, GROWN ON OYSTER SHELL AT BAYOU ST. DENIS, LOUISIANA.

[Figure natural size.]

were repeated on two adjoining areas of the same size, the quantity of material in these cases being reduced to 30 and 20 bushels, respectively.

During 1907 the plants with oyster shells were made April 16, May 21, and June 25, and a single plant of clam shells was deposited on May 21. Thirty bushels of oyster shells were spread, each, on July 26, August 26, September 26, and October 29.

In 1908 oyster shells were deposited broadcast and in piles on April 20 and May 27. There were in all 25 plantings, and on every one excepting that of October 29, 1908, a set of spat was secured before the end of the year in which the shells were deposited. The plants of April, May, and June, 1908, remained barren during the period in which the crevasse water was pouring over the beds, but after this was stopped and the water grew more salt a small set appeared on these shells, a larger one being prevented probably by the silt deposited by the flood waters.

The results demonstrated that under usual conditions a strike of young oysters is almost certain to occur upon shells or other cultch deposited between April 1 and October 1, a period of six months. Even in the case of the October plant the shells, notwithstanding their long exposure, were still in condition to receive a small set in the following spring.

The proportion of shells to which young oysters attached within a month after they were planted varied from 40 to 90 per cent, those planted in May, June, and July being usually most effective as spat collectors. The shells spread broadcast were more efficacious than those deposited in piles, though the latter usually became leveled by the waves after the lapse of a few months. The clam shells were less effective than oyster shells, probably in part because, being lighter and smaller, many of them were carried by currents and waves away from the squares on which they were planted. From 1 to 5 young oysters were found attached to the oyster shells at the end of one year, the average being about 2 or 3 to each. At a later date the shells became more or less disintegrated and broken, resulting in a natural culling which freed the oysters from their attachment. After the lapse of a year most of the clam shells bore but single oysters, though there were occasionally two attached.

The experiments indicate that from 400 to 600 bushels of shells per acre can be advantageously planted on firm or moderately firm bottom. On soft bottom more should be used, as some will become buried in the mud. Later, when there are more breeding oysters in the vicinity and the waters become more thoroughly charged with fry, the set on individual shells will become heavier and the quantity of material planted should be reduced to prevent overcrowding. If the set should become very heavy clam shells or

broken oyster shells may prove advantageous, and it may prove good policy to cull the oysters at the end of the first eight or ten months so as to permit them to grow to good shape. At present this is unnecessary. In many cases the shells and débris culled off, if taken ashore and weathered, would suffice for planting other areas.

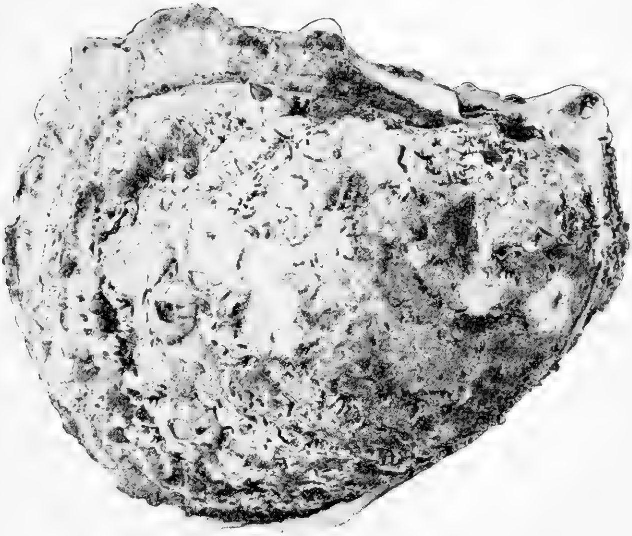
The rate of growth of oysters attaching to oyster shells was more rapid than of those striking on clams, probably because they were raised higher above the bottom and therefore more favorably situated for obtaining a supply of food. This fact and the average sizes attained by the oysters at different ages are shown in the following table:

AVERAGE LENGTH OF OYSTERS ATTACHED TO PLANTED SHELLS AT DIFFERENT AGES (ONE TO THIRTY-THREE MONTHS).

Ages.	On oyster shells.	On clam shells.	Ages.	On oyster shells.	On clam shells.
	Inches.	*Inches.*		*Inches.*	*Inches.*
1 month	0.4	0.4	6 months	1.4	
2 months	.5		12 months	2.8	2.2
3 months	.7		24 months	3.5	2.8
5 months	1.1		33 months	4.0	3.25

This table assumes the ages of the oysters to date from the time of planting the shells, but as the strike is ordinarily distributed over several months, the ages, excepting of the youngest, are somewhat overestimated. It will be observed that at the end of the first year the planted oyster shells bore oysters, whose average size was somewhat above the minimum market limit, and many of them were between 3 and 3½ inches long. At 2 years of age they were between 3 and 4 inches long and averaged 3½ inches, while in less than three years from the date of planting all of them were between 3½ and 5 inches long and averaged about 4 inches. These oysters were all of fine shape, with rather heavy clean shells, and in small clusters or single, requiring very little culling to fit them for market. Those raised on clam shells, though of smaller size, were of particularly fine shape and all single. At an age of 33 months they ran from 500 to 525 oysters to the barrel of 3¼ bushels, while those grown on oyster shells rated between 425 and 450.

During most of the period of the experiment all of these oysters were fat and in fine condition for the market, and in January, 1909, when the work was brought to a close, they were equal in fatness to the famous oysters of Lynnhaven, Va., and yielded about 5½ pints of thoroughly drained meat per standard bushel, which is equivalent to nearly 7 pints as measured at the shucking houses. The greater thickness of the shells caused them to "turn out" a smaller quantity of meats per bushel as compared with the thin shelled oysters of



OYSTERS, AVERAGE SIZE, 24 AND 33 MONTHS OLD RESPECTIVELY, GROWN ON CLAM SHELLS AT BAYOU ST. DENIS, LOUISIANA.

[Figures natural size.]

Falsemouth Bay, which they equaled or slightly excelled in fatness, but their superiority in appearance more than compensated for this. A clean, attractive-looking exterior is of importance in high-grade oysters used in the "counter" or "shell" trade, the most lucrative market which the planter can supply. The authors have been informed that the oysters left on the experimental beds have been taken up by oystermen and sold for $2 per barrel in New Orleans at a time when ordinary oysters could hardly be disposed of.

Unfortunately here, as at other of the experimental plants in the state, the authors were not able to make ultimate determinations of the productivity of the grounds, owing to the theft of most of the marketable oysters prior to the final examination. The average growth on the older sections of the planted beds in January, 1909, was but 140 bushels per acre, though examinations made in the preceding May showed that in places the density of the oysters was at the rate of between 1,500 and 2,000 United States standard bushels per acre, and a conservative estimate would place the average for the entire area at between 1,000 and 1,500 bushels or 300 and 450 barrels per acre.

BAY TAMBOUR.

The work at Bay Tambour was coincident with that at Bayou St. Denis and the same methods were followed, but the experiment was abandoned so far as the planting of cultch was concerned at the end of June, 1907.

The plant was located off the western point of a small island lying west of Bayou Andre, on the site of an extinct oyster bed, the only evidence of whose former existence is in the shells deeply buried in the mud. The currents are moderate, being perhaps of about half the strength of those at Bayou St. Denis. The water in the three years during which the observations were continued had an average specific gravity of 1.0146 and a range between 1.010 and 1.020. This salinity is considerably higher than at Bayou St. Denis, but, considering the requirements of the oyster only, is well adapted to oyster culture. Residents stated, prior to the beginning of the experiment, that the water at this place killed oysters, but, as is shown by the investigations hereafter recounted, this is an error, the mortality among the young oysters being due to another cause, although indirectly attributable to the relative saltness of the water as compared with more northerly parts of the bay. At this locality there is very little probability of loss from the effects of crevasses or from sudden and drastic changes in the saltness of the water from any cause.

The bottom in the immediate vicinity of the plantation is hard, but much of that adjoining is soft, though a considerable area could be utilized for oyster culture.

Food is abundantly produced in the waters of the vicinity, and although there is considerable fluctuation in the supply, the average of a number of observations made on the planted grounds is higher than was attained in most parts of the state. The food production in the adjacent parts of Barataria Bay is very high, and there would therefore appear to be an abundant reserve supply. The seed oysters, originally planted as brood stock, which were rough and unculled as taken from the reefs, about 2½ inches long, and planted at the rate of about 800 bushels per acre, grew rapidly and were always fat and in good condition. The various observations of the salinities, temperatures, and food production of the water are shown in the following table:

FOOD CONTENT, SPECIFIC GRAVITY, AND TEMPERATURE OF WATER IN BAY TAMBOUR.

Date.	Specific gravity.	Temperature.	Food organisms per liter of water.	
			Number.	Volume.
1906.		° F.		Cu. mm.
April 25	1.0117	74.3	16,000	0.313
27	1.0102	77.9	15,500	.329
May 26	1.0129	81.5	11,000	.262
28	1.0124	86.0	7,000	.206
June 27	1.0166	78.8	7,500	.118
29	1.0167	77.0	5,000	.060
August 20	1.0195	85	9,000	.240
November 10	1.0191	75	5,400	.185
1907.				
January 10	1.0170	68	2,000	.018
April 17	1.0203	78	6,750	.220
19	1.0175	80	10,800	.689
30	1.0158	80.6	8,100	.376
May 22	1.0097	80.6	6,000	.173
June 26	1.0113	84.2	7,200	.181
July 24	1.0136	86	10,200	.420
December 11	1.0131	53	1,500	.081
1908.				
May 4	1.0141	77	35,000	.807
July 3	1.0100	81	8,100	.259
1909.				
January 29	1.0172	68	21,750	.673
Average	1.0146	....	10,200	.295

About 50 barrels of rough unculled oysters from the natural beds were planted in January, 1906, and in the latter part of the following April oyster and clam shells were planted after the manner of those deposited at Bayou St. Denis, followed by two similar plants in the latter parts of May and June, respectively. In all these the apparent set of spat was light, the number of shells bearing young oysters ranging between 15 and 35 per cent of those examined, the average of all plants being about 22 per cent. By the following spring all of these young oysters had disappeared. The results of the second year's experiments were even more unfavorable, and spat transplanted from Bayou St. Denis were also killed within a few weeks.

BORERS, OR "SNAILS" (PURPURA HÆMOSTOMA), THEIR EGG CASES, AND OYSTER SPAT DRILLED BY THEM. BAY TAMBOUR, LOUISIANA.

[Figures natural size.]

It was observed that the few upper valves still adherent to the shells were perforated by small holes, and as the gasteropod *Purpura*, locally known as the "borer" or "snail," was abundant on the stakes marking the beds it was at once suspected to be the cause of the mortality. To test this hypothesis three boxes were constructed of one-fourth inch wire screening and planted on the beds on April 17, 1907; one, closed, containing both shells and borers; one, closed, containing shells alone; and the third, open, with shells only. On June 26 the contents of the boxes were examined with the following results: In the open box 18 per cent of the shells bore spat, of which several were dead, and there were 5 borers besides several fishes and crabs. In the closed box, containing shells and 12 borers, but 2 per cent of the shells bore live spat, and these were concealed either under the shells or by marine growths. In the closed box without borers 60 per cent of the shells bore live spat, averaging two to the shell. This box contained when taken up 14 very small borers which had evidently entered through the mesh.

On June 26 two closed boxes were planted, one with clean shells and 9 large borers, and the other containing shells bearing spat from one-half to three-fourths inch long, but with no borers. When taken up on September 1 the shells in the first box were devoid of spat of appreciable size, the large borers were dead, and there were no small ones. In the other box there were 17 live borers between three-eighths and $1\frac{1}{4}$ inches long which must have crawled through the mesh when quite small; there were no dead borers, but 2 per cent of the spat had survived and all of the upper valves remaining attached showed the small perforation made by this enemy.

The brood oysters planted in January, 1906, when they were between 2 and 3 inches long, at no time showed any greater mortality than was to be expected from the mere act of transplanting, and this fact in connection with the experiments just recounted shows without much doubt that the failure to obtain results from planting shells was due, not to the quality of the water, per se, but to the destructive habits of the borer. The largest spat killed was less than $1\frac{1}{4}$ inches in length, and it is safe to assume that seed oysters 2 inches long and probably as small as $1\frac{1}{2}$ inches will be immune.

The borers lay their eggs in red or purple leathery capsules about one-half inch long, attached in dense clusters to shells, stakes, and other fixed bodies in the water. The capsules are demicylinders, usually more or less curved toward the convex surface and with flattened or slightly convex free ends. Each capsule contains several eggs and the young snails escape through holes less than one-fiftieth of an inch in diameter, which they cut in the free end of the capsule.

These recently-hatched borers probably feed upon the very minute and newly-attached spat, though of this we have no certain knowledge. Growth is rapid, as is shown by the experiments with boxes. The mesh employed in these was one-fourth inch square, and the largest borer that could be pushed through measured seven-sixteenths of an inch in length. In closed boxes planted June 28 there were borers three-fourths to $1\frac{1}{4}$ inches long on September 1, an increase of from 75 to 190 per cent in length and of from 200 to 450 per cent in bulk within a period of about two months.

The difficulties in fighting a small and insidious enemy such as this are very considerable. It is wholly impracticable to inclose the beds, as is done to prevent the inroads of drumfish and similar enemies, the little snails being able to travel through the finest practicable mesh, and the only recourse is to wage unceasing warfare by destroying all borers and egg cases found. To tong or dredge the oysters especially for this purpose is commercially impracticable under the market conditions obtaining in Louisiana, and the obvious course for the oyster culturist in the more salt waters in which the borer abounds is to eschew all effort at planting shells and confine his activities to planting seed oysters at least $1\frac{1}{2}$ inches and preferably not less than 2 inches long. If he does this the presence of this enemy may even prove a boon in preventing the excessive attachment of spat to the older oysters, an occurrence which in some places on our coasts renders it impossible to grow oysters fit for market.

As to the rate of growth of oysters in the earlier stages at Bay Tambour little can be said for reasons which are apparent. The growth of the seed oysters planted at the beginning of the experiment was very satisfactory. In April, 1906, measurements of the length of a number of these averaged 2.6 inches. In June, 1907, the average length was a little less than 4 inches, and in May, 1908, it was about 5 inches. In less than two years, therefore, these oysters doubled in length, and despite the fact that they were not culled, the clusters automatically broke apart to some extent, owing to the disintegration of the shells to which they were attached, and there was a corresponding improvement in shape. The growth here was about the same as at Bayou St. Denis, and indicates that however unsuitable this part of the bay may be for spat culture, owing to the reasons before set forth, there is an excellent opportunity for the establishment of an important and profitable industry in growing oysters from seed.

The results attained by the work at Bay Tambour are applicable to all of that half of Barataria Bay lying nearer the gulf, our investigations having shown the conditions to be essentially similar throughout that region. During the last year or two of the experiments a

OYSTER, AVERAGE SIZE, GROWN IN 29 MONTHS FROM SEED ABOUT $2\frac{1}{2}$ INCHES LONG.
BAY TAMBOUR, LOUISIANA.

[Figure natural size.]

considerable area of bottom was taken up by planters in this region and most of the oysters shipped during the oyster season 1908–9 were grown on these leaseholds. It is understood that the business was very profitable and that the supply of Barataria oysters, despite their lack of previous reputation, was unequal to the demand. They were all contracted for at a price equivalent to $1.60 per barrel on the beds and could have commanded a higher price in the open market. It is the opinion of the authors that they are among the best produced on our entire coast.

ST. BERNARD PARISH.

St. Bernard Parish embraces the most productive natural oyster region in Louisiana and at the present time produces about 40 per cent of the total yield of the state. Its oyster beds lie principally in what is known as the "Louisiana marshes," a low uninhabited expanse of sea marsh and prairie covering an area of between 400 and 500 square miles between Mississippi, Chandeleur, and Isle au Breton sounds. This region is cut up into innumerable islands by an intricate system of bays and bayous, most of which contain natural oyster beds, described and platted in some detail in the report of the investigations in 1898, previously alluded to.

In the season of 1906–7 St. Bernard Parish produced upward of 1,000,000 bushels of oysters, but in the following season the production was somewhat smaller. Although there have been some attempts at oyster culture and there are extensive leaseholds, most of these oysters came from the natural beds.

In 1898 there were no leases of bottom in this region and few were granted prior to 1904, when what was practically the present oyster law went into operation. In the next five years 66 leases were issued, and in 1908 there were in force 48 leases, aggregating 5,395 acres, of which 44 leases and 4,456 acres were in the Louisiana marsh and 4 leases and 939 acres in Lake Borgne.

Many of the leases are for plots less than 20 acres in extent, but 9 individuals, firms, and corporations have holdings of between 100 and 1,000 acres each, covered by 25 leases aggregating 4,858 acres. These have been planted in part with seed oysters and shells, but the business has not yet proved very profitable owing mainly to the fact that the set of spat has been so heavy as to cause overcrowding of the beds with the consequent failure of the oysters to fatten and grow to good shape.

The salinity of the water varies considerably in the several parts of the region under discussion, being as a rule lower in Lake Borgne and the waters closer to Mississippi Sound and higher toward Chandeleur Sound and the southern part of the parish. This is shown in

the following table of the specific gravities observed during four calendar years:

SPECIFIC GRAVITY OBSERVATIONS IN WATERS OF ST. BERNARD PARISH.

Locality.	1906.	1907.	1908.	1909.
Lake Borgne	1.0068	1.0041	....	1.0051
Falsemouth Bay	1.0074	1.0058	1.0016	1.0075
Three-mile Bay	1.0070	1.0054	1.0041	1.0083
Treasure Bay	1.0106	1.0096	....	1.0125
Big Mussel Bay	1.0119	1.0113	....	1.0128
Eloi Bay	1.0125	1.0150	....	....
Saw Bay	1.0167	1.0155	....	1.0159
Blind Bay	1.0193	1.0162	....	1.0170
Caligo Bay	1.0200	1.0162	....	1.0159

In the northern localities the water is rather too fresh to produce palatable oysters for shell stock, though this does not affect their utility for shucking and canning purposes. In this region, as a whole, oyster food is abundant, a large number of observations indicating that it is about equal in this respect to that part of Placquemines Parish adjoining it, east of the river, and only exceeded by the waters of Barataria Bay. It is considerably richer than either Terrebonne Parish or that part of Placquemines Parish, as a whole, lying about Bay Adam, Bayou Cook, and Bastien Bay. The richest waters are Falsemouth Bay and Treasure Bay and the poorest those lying near Three-mile Bayou.

The depth of water ranges generally from 3 to 6 feet in the bays, but is often much deeper in the bayous. The bottoms are generally soft, in many places too soft to be used for oyster culture without special preparation, but there are also considerable areas of hard or moderately hard mud. Even the softest places may be made available by strewing them with shells, sand, or gravel, but there is undoubtedly enough naturally suitable bottom to make this unnecessary for some time to come.

For experimental purposes in this region there were selected two localities not far apart but differing in all factors involved excepting that of salinity. The localities, the experiments, and the results are described in the following:

FALSEMOUTH BAY.

Falsemouth Bay lies in the northwestern part of the Louisiana marsh and communicates with Mississippi Sound by means of Nine-mile Bayou, a channel from 100 to 300 yards in width, and with an average depth of about 24 feet. A smaller, though deep, bayou leads to Nine-mile Bay to the eastward, and there is wide communication at the southeast end with the lower part of Nine-mile Bay and the upper part of Treasure Bay.

Writing in 1898 one of the authors said:

It seems probable that the scarcity of oysters in Falsemouth Bay is due in large part to the lack of suitable places of attachment for the spat, and if this be so there is but little doubt that productive beds might be established by planting shells, together with a sufficient number of brood oysters to furnish fry. We found here the largest area of firm bottom discovered anywhere within the limits of the reconnoissance. In most other parts of the district the hard bottom is distributed in small patches lying like islands in the midst of soft mud, but in Falsemouth Bay shells and seed could be deposited almost anywhere without danger of becoming engulfed. The amount of oyster food is larger than almost anywhere else in the district, the average number of diatoms in each liter of water 1 foot above the bottom being about 22,000. The extreme fatness of the oysters is also ample evidence of the abundance of food, although, of course, the amount available for each individual would become less if planting were extensively undertaken.

Although, as previously stated, considerable areas of bottom have been leased in contiguous and neighboring waters, the recommendations just quoted have borne no fruit, and it was with the purpose of testing their validity that experiments were undertaken at this place.

The site selected for the experimental work was in a small bight in the northeastern part of the bay, about one-third of a mile from the mouth of a deep cut-off running into Nine-mile Bayou. The water has a depth of about 3½ feet at low tide.

Pirate Point on one side and a chain of several small islands on the other form a somewhat funnel-shaped area with its small end opening into Nine-mile Bayou and its large end communicating with Treasure Bay and the waters to the eastward. The tidal flow entering and leaving the interior waters in large part passes through this area, and, as the bayou communicating with Mississippi Sound is wide and deep, the currents, especially in the northern part, where the plantation is located, are moderately strong and constant. Measurements on the planted beds indicate a current of about one-half mile per hour on moderate tides, and observation showed the rate to be approximately uniform over an area of several thousand acres in this vicinity and probably over the entire eastern part of the bay. The importance of this fact need not be indicated to practical oyster planters.

The salinity of the water is comparatively low, rendering the oysters rather insipid when used as "shell stock," but not interfering with their value for the shucking trade. During the spring and summer of 1908 the water was nearly fresh, its specific gravity ranging about 1.0020, but at all other times during the experiment it was somewhat higher, fluctuating between 1.0030 and 1.0092, with an average of 1.0056 for the entire period and about 1.0070 in the oyster season. During the three years of the investigation there was

nothing to indicate any mortality among the oysters due to the low salinity of the water.

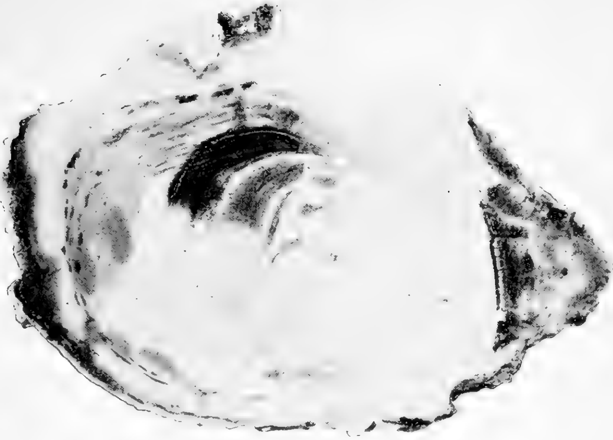
The floor of Falsemouth Bay is level and clean of all rubbish and débris. The bottom is quite uniformly composed of hard mud, much like that of the surrounding land, though there are occasional small patches of softer consistence. The bay has an area of about 11 square miles, and over practically all of it oysters and shells may be planted without danger of being engulfed. There are not now, nor, apparently, have there ever been, any natural reefs, and the few very scattering oyster growths observed in 1898 seem to have been exterminated.

In oyster food Falsemouth Bay was found to be one of the richest places in Louisiana in 1898, and the results of the present examination show that it retains this rank. The average oyster-food content of its waters from May, 1906, to January, 1909, was higher than that of any other locality observed, excepting only the middle of Barataria Bay. Falsemouth Bay and Bayou St. Denis, in Jefferson Parish, were about on an equality. The following table shows the fluctuations in the observed food supply, together with the specific gravities and temperatures of the water at various times during the course of the experiments:

FOOD CONTENT, SPECIFIC GRAVITY, AND TEMPERATURE OF WATER IN FALSEMOUTH BAY.

Date.	Density.	Temperature.	Food organisms per liter of water.	
			Number.	Volume.
1906.		°F.		Cu. mm.
May 9	1.0092	72.5	38,000	1.594
June 10	1.0064	86.0	5,500	.201
July 17	1.0066	82.0	8,000	.216
1907.				
January 5	1.0084	64.0	4,000	.094
April 12	1.0059	72.0	9,000	.316
May 16	1.0030	77.0	14,400	.436
June 9	1.0028	84.2	7,200	.291
July 7	1.0079	87.8	2,500	.067
December 13	1.0070	54.5	5,400	.226
1908.				
April 23	1.0020	79.0	7,200	.372
June 5	1.0030	87.0	3,750	.173
July 12	1.0029	85.0	7,500	.346
1909.				
January 24	1.0075	64.4	4,800	.119
Average	1.0056	....	9,020	.342

No oyster enemies whatever were observed in this locality. The water is too fresh for the borer ever to become troublesome, but the drumfish, which operates in water of all degrees of saltness, might make occasional forays if oysters were numerous enough to be attract-



OYSTERS, AVERAGE SIZE, 1 YEAR OLD, GROWN ON OYSTER SHELLS AT FALSEMOUTH BAY LOUISIANA. THE UPPER FIGURE SHOWS THE CHARACTERISTIC DEEP CUP

[Figures natural size.]

ive. There were a few mussels and barnacles attached to the planted oysters, but they were not abundant enough to be troublesome.

The experiments in Falsemouth Bay began on May 6, 1906, and subsequent plantings were made on June 10 and July 17, 1906; April 12, May 16, June 9, and July 7, 1907, and April 23 and June 5, 1908. The final examination was made on January 23 and 24, 1909. In all, 14 plantings were made, of which 2 were of clam shells, both whole and broken, spread broadcast, 9 were of oyster shells, broadcast, and 2 of oyster shells in piles.

The quantity of oyster shells planted varied from 200 to 1,000 bushels to the acre and the clam shells from 200 to 600 bushels per acre. The clam shells, which were hardly more than 1¼ inches in diameter, were obtained from neighboring shell banks, and many of them were fragmented by wave action. On the whole they did not prove satisfactory, the entire shells being scattered by the waves and the fragments soon becoming so covered with silt and mud that they offered very imperfect places for the attachment of the oyster spat. The oysters produced on these shells were all single and of fine shape, but, as was also observed at Bayou St. Denis, they grew more slowly than those attached to oyster shells. If somewhat larger and heavier clam shells can be conveniently obtained, they would doubtless make excellent cultch, but the use of the local supply can not be recommended, except for the purpose of hardening the small areas of soft bottom which occasionally occur in the bay.

From 60 to 90 per cent of the oyster shells were found to bear small oysters at the end of the season in which they were planted, the spat striking in every month from April 11 to July 17. Doubtless shells planted a month earlier and a month or two later would prove as effective as in Barataria Bay, but there is no positive evidence of the fact in this locality. The average number of oysters attached at the end of the season, after they had attained a length of 1 to 2 inches, was from two to three per shell, there being some larger clusters and a good proportion of single oysters.

The set was much lighter than in the adjacent waters of Three-mile Bayou, owing undoubtedly to the relative remoteness of considerable beds of spawning oysters. This is of considerable advantage in avoiding crowding of the growing oysters and promoting a better shape and condition. Should the bay be used extensively for planting shells it will probably be found that the set will be much heavier than now occurs, and to secure the best results it may be necessary to break up the larger clusters produced so as to give the individual oysters room to grow and fatten. Under the present conditions from 400 to 500 bushels of cultch per acre appears to be the best quantity to plant, but with any heavy increase in the number of

spawning oysters in the vicinity, as from extensive planting operations, this quantity may probably be advantageously reduced.

The yield per acre of the planted beds could not be determined, as prior to the final examination the oysters proved too attractive to the tongers, and most of the plantation was despoiled of both oysters and shells. Certain small areas which had been overlooked by the marauders, however, indicated that the growth on some sections at the end of about thirty months from the time the shells were planted was probably between 1,000 and 1,500 United States standard bushels per acre. The oysters were of good shape and very fat. Those grown on oyster shells were from $3\frac{3}{4}$ to $4\frac{1}{2}$ inches long and averaged about 200 to the bushel, while those on clam shells were of even finer shape and averaged about 3 inches in length. The shells were rather thin, but somewhat thicker in the clam-shell set than on that attached to the oyster shells, in the former consituting 70 per cent of the total volume of the unopened oyster, and in the latter 55 per cent. The oyster-shell set averaged about 200 oysters to the standard bushel, considerably more than oysters of the same length at Bayou St. Denis, the difference being due to the much thicker, heavier shells of the latter. These oysters, taken "the run of the bed," without selection, shucked slightly over 7 pints of completely drained meats per standard bushel. The single oysters grown on clam shells were relatively fatter, but owing to their thicker shells would "turn out" no more meat per bushel.

Taking all factors into consideration, Falsemouth Bay appears to possess very great advantages for planting operations on a large scale in connection with the shucking trade, but the salinity is too low and the shells are rather too thin, excepting those grown on clam shells, for raising "shell stock" or "counter" oysters.

The bottom is almost everywhere firm enough for planting, the rate of growth is rapid, the shape of the oysters is good, and the relatively thin shells, taken in connection with the plumpness of the meats, insures a large yield of shucked oysters per bushel, effecting economy in transportation and opening. The meats are also attractive in appearance and should command a good price as "extra selects."

The only drawback is that the shells are in some cases rather brittle and may break in opening, but this defect is more than counterbalanced by the large quantity of meats "turned out" per bushel.

Either seed oysters from the natural reefs or cultch may be planted to advantage. In the latter case it is not unlikely that, if a considerable part of the bay is converted into oyster bottom, the set of spat may be so heavy as to require the clusters to be broken up at the end of the first season's growth.

OYSTER, AVERAGE SIZE, 33 MONTHS OLD, GROWN ON OYSTER SHELL AT FALSEMOUTH BAY, LOUISIANA.

[Figure natural size.]

It is believed that over a large part of the bay the bottom is sufficiently firm to permit the use of light dredges on the planted beds. In water so shallow as that in Falsemouth Bay the dredge, as compared with tongs, is not so economical as in deeper water, but it is believed that it would be cheaper to operate in case of a scarcity of labor.

In Falsemouth Bay, as everywhere else, however, there is a limit to the quantity of good oysters that can be produced, and should the planting industry be established there care should be exercised that neither the density of growth nor the area planted should become excessive. The desire of persons already established to grow as many oysters as possible on a given area, and the equally strong desire of prospective planters to establish themselves in places where others have been successful has more than once brought difficulties to all.

THREE-MILE AND NINE-MILE BAYS.

Three-mile Bay and its contiguous waters constitute the most important oyster region of St. Bernard Parish. Three-mile Bayou is a broad, deep passage connecting Mississippi Sound with the interior of the Louisiana marsh, and the vessels engaged in carrying oysters to the oyster houses and canneries on the mainland lie in the sheltered waters at its inner end to receive the cargoes brought there by the luggers engaged in oystering in the adjacent bays and bayous.

In 1905 a large shucking house was erected on the shores of this bay, with the purpose of avoiding the transportation of the bulky, unshucked oysters to the mainland and the return of the shells for planting on the large area which the operating company had leased for that purpose in the waters adjacent to the establishment. Owing to the difficulty of obtaining employees to work in a locality so remote from settlement, and perhaps to other causes not stated, this establishment was soon abandoned. In addition to the bottom held by this company there are several thousand acres under lease in this vicinity and practically all of the leases issued in St. Bernard Parish are in these or immediately adjacent waters.

It is an interesting observation that these planters have overlooked the advantages of the near-by bottoms in Falsemouth Bay to take up areas which are in almost every respect inferior, this action being dictated by the existence of natural beds in the one region and their absence in the other. The fact has been overlooked that the presence or absence of oysters is in many cases conditioned solely by the presence or absence of clean, firm bodies to which the young may attach. Oyster culture in this region has consisted partly of planting seed

oysters from the natural beds, but largely in the deposit of shells, neither having as yet proved very profitable for reasons which were developed by the result of the Bureau's experiments.

The experimental plantation was located about one-third mile west of Shell Point, practically on the border line between Three-mile and Nine-mile bays, though rather in the latter than in the former. It is about 2½ miles in a straight line from the Falsemouth Bay plantation, though the water route between the two, owing to the interposition of Pirate Point Island, is over 4 miles. South Bayou, a shallow body of water with sluggish currents, opens through the shore line about one-fourth mile distant. Between the plantation and Raccoon Island there is a scattering natural growth of oysters of fairly good shape and quality. The water at the plantation is about 3½ feet deep, gradually shelving to 5 and 6 feet toward the middle of the bay.

Tidal waters enter the bay from Nine-mile and Three-mile bayous, flood tides meeting and ebb tides dividing near the plantation, and as the flow through South Bayou is insignificant the currents in this particular region are sluggish. The conditions in this respect are better in both directions along shore, and in Nine-mile Bay near the entrance to the eastern fork of Nine-mile Bayou and in most of Three-mile Bay proper the water flows with fair velocity.

The salinity of the water during the period of the experiments was approximately the same as in Falsemouth Bay, the specific gravity ranging from 1.0028 to 1.0088, with an average for all observations of 1.0057. The average salinity of the waters of Three-mile Bay proper is somewhat higher, the specific gravity off Shell Point averaging about 1.0076. The average during the oyster season was slightly less. The significance of this comparative freshness of the water in its effect upon the flavor of the oyster and the occurrence of enemies has been mentioned in connection with the description of Falsemouth Bay.

Away from the immediate vicinity of the shore the depth of water in Three-mile and Nine-mile bays is between 4 and 6 feet, with somewhat shoaler spots on some of the dense, natural reefs. The bottom on the plantation is composed of moderately soft mud, which grows softer offshore, though its consistency is such as to permit the successful planting of shells over a considerable area.

The supply of oyster food in Nine-mile and Three-mile bays is comparatively low, on the plantation averaging but about one-half the quantity per unit of water found in Falsemouth Bay. Farther to the eastward, off Shell Point, the quantity is somewhat greater, and to the southward the quantity increases from the mouth of Falsemouth Bay to Treasure Bay, where the waters are approxi-

mately as rich as on the Falsemouth Bay plantation or at Bayou St. Denis, in Jefferson Parish.

The following table exhibits the observed data in respect to the oyster food supply, the specific gravities, and the temperatures of the water at the plantation:

FOOD CONTENT, SPECIFIC GRAVITY, AND TEMPERATURE OF WATER IN THREE-MILE AND NINE-MILE BAYS.

Date.	Specific gravity.	Temperature.	Food organisms per liter of water.	
			Number.	Volume.
1906.		°F.		Cu. mm.
May 8	1.0054	73.4	....	....
9	1.0065	72.5	11,000	0.290
June 9	1.0082	86.0	3,500	.078
July 17	1.0080	83.0	6,000	.060
1907.				
January 5	1.0088	65.0	2,500	.053
April 12	1.0077	75.0	7,800	.203
May 15	1.0057	75.2	8,250	.307
16	1.0038	68.0	7,000	.282
June 9	1.0028	84.2	4,500	.210
July 7	1.0090	84.2	2,500	.037
December 13	1.0071	55.0	4,500	.238
1908.				
June 5	1.0040	87.0	750	.040
July 12	1.0042	84.0	4,500	.137
1909.				
January 23	1.0083	68.0	11,000	.364
Average	1.0057	....	5,271	.177

During the investigations of 1898 a few borers were found in Three-mile and Nine-mile bays, but none were observed during the experiments here dealt with, and it is probable that they are never destructive owing to the prevailing low salinity of the water. There were, however, many mussels attached to the oyster clusters, and in some cases they undoubtedly interfered materially with the growth of the oysters and seriously curtailed their food supply.

The site for the experiment was selected partly for the sake of comparison with the work in Falsemouth Bay, and partly because it was located on leased bottom and under the care of a watchman. The plantings were made practically synchronously with those in Falsemouth Bay, and in essentially the same manner excepting that no clam shells were used. The first plant was made on May 8, 1906, and others followed on June 9 and July 16, 1906; April 12, May 15, June 9, and July 7, 1907, and on April 23 and June 6, 1908. In all, 16 plantings were made, of which in 11 cases the shells were spread broadcast, and in 5 cases in heaps of from one-half to 1 bushel each. As in Falsemouth Bay, the quantity of shells varied from 200 to 1,000 bushels per acre.

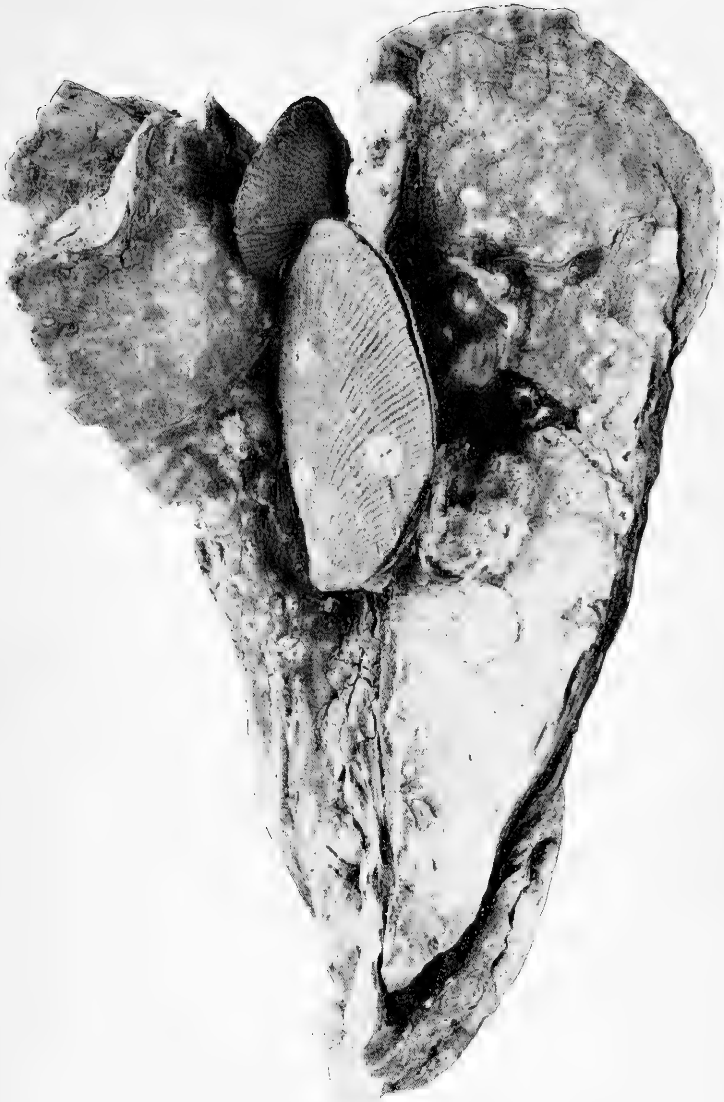
The strike was much heavier than in Falsemouth Bay, a phenomenon correlated with the greater number of breeding oysters in the vicinity and the consequent more general and copious distribution of the free-swimming young oysters. During the first year about 95 per cent of the shells tonged up after the lapse of a few months bore spat, and the average number of young oysters was 6 or 7 to the shell, but after the lapse of the first year the number of oysters per shell had decreased somewhat. In the second year the number of shells receiving a strike was about the same, but there were fewer spat per shell. In the first year the clusters were composed of from 1 to 11 individuals, and in the second year of from 1 to 7 or 8.

Considering the density of the set in these waters the experiments indicate that the shells should not be planted in greater quantities than from 200 to 400 bushels per acre, though on the softer bottoms, where some of the cultch will sink in the mud, the quantity may be increased with advantage to perhaps 500 bushels. On the bottom experimented with there was apparently no advantage in depositing the shells in piles and, in fact, the more evenly they are distributed, the less the chance that the oysters will become so massed as to interfere with their growth and nutrition.

The yield per acre at the end of the thirty-two months was about 1,500 standard bushels of culled oysters, with about an equal amount of shells, fragments, and mussels. The oysters were badly clustered and the débris was made up largely of those which had died from overcrowding. They were long, narrow, thin-shelled, and in general of the type known to the oyster men as " coony " or raccoon oysters.

These oysters were about $2\frac{3}{4}$ inches long at the end of eleven months, $3\frac{1}{2}$ inches in twenty months, and from 4 to 5 inches, with an average of about $4\frac{1}{2}$ inches, at the end of thirty-two months. Although they were longer than those of corresponding age raised in Falsemouth Bay, they were so narrow and flat that the latter were over 50 per cent more bulky in specimens of the same length. The volume of the shells in both cases bore about the same relation to the total volume, and the difference was solely in the deeper and more capacious cavity of the Falsemouth Bay oysters, which is correlated with the volume of the meats.

By actual count the 32-months-old oysters raised on this plantation averaged about 240 to the standard bushel and they turned out about $3\frac{1}{2}$ and 4 pints of drained meats per bushel, approximately half the quantity yielded by a bushel of Falsemouth Bay plants. This extremely low yield for such thin-shelled oysters was due in part to the small size of the cavity, but also largely to their extremely poor condition as regards fatness. The experiment was tried of culling the oysters on half of one section of the planta-



OYSTERS, AVERAGE SIZE, 33 MONTHS OLD, GROWN ON OYSTER SHELLS AT THREE-MILE BAY, LOUISIANA.

[Figure natural size.]

tion one year after the shells were planted and it was found that these oysters, broken in small clusters, improved somewhat in shape and yielded a larger return of meats per bushel, though they were not any fatter than the unculled oysters on the adjoining bottom.

Owing to their shape, clustering, and poor condition, the oysters raised at this place were useless except for steaming. Planted oysters in other parts of the bay were found to be almost as poor in most respects, although perhaps a little fatter. These results are undoubtedly due in part to the crowding of the oysters, and for that reason the breaking up of the clusters at the end of about nine or ten months would be advantageous, but more important factors are the sluggish currents in the places more remote from the discharges into Mississippi Sound and the general paucity of the microscopic life on which the oysters feed.

So far as we have been able to learn the natural oysters in Three-mile Bay and immediately adjacent waters are never more than moderately fat and are often poor as measured by what is attained elsewhere, and it is evident that if oyster culture in this region is to be successful it must be prosecuted with caution. Care must be exercised to locate the planted beds in those places where the currents are strongest, as in the waters near Three-mile Bayou and the eastern fork of Nine-mile Bayou. Oysters and shells should be planted rather sparsely and effort made to prevent the formation of large clusters, or if they are formed they should be broken up as soon as the individuals attain a size and strength of shell to permit culling.

Not only must an excessive density of oyster growth be guarded against but the total area planted should not be allowed to become so great as to overtax the powers of the water to produce food organisms. The authors do not regard this locality as a very promising field for oyster culture, though, undoubtedly, large quantities of oysters of rather poor quality can be produced. It may be that the place will prove valuable for the raising of seed oysters for transport to localities more favorable for fattening.

TERREBONNE PARISH.

Terrebonne Parish includes practically the whole oyster-producing region between Barataria Bay and the mouth of the Atchafalaya River, the product of Lafourche Parish, which adjoins the west side of Jefferson Parish, being insignificant. Several large bodies of water, the western part of Timbalier Bay, Terrebonne Bay, locally known as Cat Island or Wine Island Lake, Lake Pelto, Lake Barre, and Lake Felicity, are included within the limits of the parish, and there are numerous smaller bays, lakes, and bayous which now yield or have yielded oysters. The parish is the westernmost in

which good oysters are produced in considerable quantities, the beds in Iberia and St. Mary parishes furnishing oysters of low grade, few of which are useful for purposes other than steaming. In the oyster season of 1906–7 Terrebonne Parish produced about 190,000 bushels of oysters, and in the following season approximately 300,000 bushels, the increase being due to the beginning of productiveness of several extensive leaseholds.

In 1897, 353,000 bushels of oysters were produced in the parish, practically all of which came from the natural beds. Mr. L. R. Cary [a] states that many of the productive natural beds examined by the senior author in 1898 had been almost obliterated in 1907, and that the greater part of the oysters produced in the parish in the latter year were derived from planted beds.

In 1898 there were in effect in this parish but 32 leases, the aggregate area of which could not, legally, have been in excess of 320 acres, and in reality was probably less. In 1908 there were in force about 430 leases, aggregating about 6,000 acres. Most of these were for parcels of less than 20 acres, but there were several holdings of between 100 and 1,000 acres. The recent tendency has been for the large leaseholders to surrender parts of their bottom, retaining such portions only as experience has indicated to be the most suitable and profitable for oyster culture.

The methods of culture followed usually have not been such as to produce the best grade of oysters. Very few shells are planted and the seed obtained from the natural beds is usually planted without culling, the result being that the oysters grow in large clusters to the serious detriment of their shape and nutrition. If care were exercised to break up the clusters properly into smaller ones or single oysters, the product could be materially improved in shape, quality, and value.

The salinity of the waters of Terrebonne Parish appears to have increased in recent years from the same causes that have operated to raise the density in the upper parts of Barataria Bay, changes in drainage due largely to improvements in the levee system. It is stated that at places in Terrebonne and other bayous where oysters now grow the water was formerly fresh enough for cattle to drink. This is confirmed by a comparison of recent salinity observations with those made in 1898, though the latter were so few that they do not serve as a satisfactory criterion of conditions at that time. The average salinities observed during the present investigations are shown in the following table:

[a] A preliminary study of the conditions of oyster culture in the waters of Terrebonne Parish, La. Bulletin 9, Gulf Biologic Station, Cameron, La.

SALINITY RECORDS FOR WATERS IN TERREBONNE PARISH.

Locality.	1906.	1907.	1908.	1909.
	Sp. gr.	*Sp. gr.*	*Sp. gr.*	*Sp. gr.*
Timbalier Bay	1.0177	1.0156	1.0109	1.0194
Lake Felicity	1.0166	1.0171	....	....
Lake Barre	1.0166	1.0164	....	....
Seabreeze	1.0164	1.0161	....	....
Bay Premiere	1.0202	....	....	....
Lake La Graisse	1.0164	....	....	....
Bay Champiere	....	1.0146	....	....
Terrebonne Bay	1.0172	1.0180	....	....
Lake Pelto	1.0180	1.0183	....	....
Pelican Lake	1.0172	1.0161	1.0160	1.0192

The localities listed above are all in the region of higher salinities, and in most places it would probably be impossible, or at least impracticable, to raise oysters on cultch, owing to the liability to attack by borers. It is probable that the disappearance of many of the natural reefs is as much due to these conditions as to overfishing, the two agencies together proving disastrous where either alone would be tolerated. In the region west of Pelican Lake, where the saltness of the water is mitigated by the discharge from Atchafalya River, and in Terrebonne, Little Caillou, and other bayous which carry fresh water from the interior, the conditions are apparently such as to permit the set and growth of young oysters on suitable planted material.

Considered as a whole, that part of Terrebonne Parish under observation during the present investigations was about as rich in oyster food as that part of Plaquemines Parish west of the Mississippi River, was considerably poorer than Barataria Bay, and was somewhat less prolific than the region east of the Mississippi in either Plaquemines or St. Bernard parishes. Food organisms were found to be most abundant in Timbalier Bay and Pelican Lake, where the supply was good, and least numerous in the open waters of Terrebonne Bay.

The depth ranges from 3 to 10 feet in the larger bodies of water, but is much deeper in many passes and bayous. There appear to be no very extensive areas of hard bottom in the region observed, excepting on the extinct natural beds, but there are many places where the bottom, while soft, would support deposits of shells or seed oysters, and there is usually a narrow fringe of hard bottom around the shores of the bays.

The experiments in this parish were carried on at two places, Seabreeze and Pelican Lake, but in neither case were satisfactory results attained from the planting of shells. Undoubtedly more favorable places could be found, but the general inaccessibility of the region and the lack of living accommodations operated to restrict the choice of localities.

SEABREEZE.

Seabreeze is the name given to an oyster house, no longer operated, situated on Bayou Terrebonne where it is intersected by Bayou La Graisse and the cut-off to Lake Barre. Below this point Terrebonne Bayou is very shallow and its discharge is mainly through Bayou La Graisse and the cut-off into Terrebonne Bay and Lake Barre, respectively. There are a number of leases located in this vicinity in Terrebonne Bayou, Bayou La Graisse, and Lake Barre, but they are all or nearly all on extinct oyster reefs and are planted with seed oysters obtained from the natural beds. Experiments were undertaken at this place for the purpose of determining whether a method could be devised for using the exceedingly soft bottom common at many places in the parish, and whether the physical and biological conditions were such as to permit the set and development of young oysters on planted materials. The site selected was a small cove on the north side of Bayou La Graisse, where the water has a depth of about 2 feet and the mud is so soft that a man wading will at once sink above his knees, a consistency which any experienced oyster grower would at once pronounce prohibitive. The currents in this cove are sluggish, but a strong circulation is maintained in the adjoining bayou. The salinity of the water at this station is comparatively high, the specific gravity during the two years in which records were made ranging between 1.0138 and 1.0206, few observations departing materially from the general average of 1.0163.

The waters of this vicinity are but moderately productive in oyster food, the observations made in Lake Felicity, Lake Barre, Terrebonne Bayou, and on the experimental beds yielding approximately the same average results. The following table gives the record on the experimental beds:

FOOD CONTENT, SPECIFIC GRAVITY, AND TEMPERATURE OF WATER ON EXPERIMENTAL OYSTER BEDS AT SEABREEZE.

Date.	Specific gravity.	Temperature.	Food organisms per liter of water.	
			Number.	Volume.
1906.		°F.		Cu. mm.
April 30	1.0174	78.8	13,500	0.297
May 2	1.0158	80.6	9,000	.193
30	1.0171	83.3	8,000	.286
31	1.0165	86	....	....
June 1	1.0162	83.3	6,000	.190
July 5	1.0164	78.8	1,000	.016
7	1.0184	78.8	2,000	.152
1907.				
January 16	1.0205	72	5,400	.144
April 20	1.0158	66.5	1,800	.097
June 29	1.0146	87	2,500	.149
Average	1.0163	....	5,355	.169

No actual observations of oyster enemies were made at this station, but the conditions are such as to make it probable that the borer may occur in sufficient numbers to prevent the successful application of the methods of planting shells and other materials for the purpose of securing a strike of spat. At this station no brood oysters were planted, the supply of floating fry originating on the natural and planted beds in contiguous waters being amply sufficient to fill all requirements. In all 16 plantings were made, the methods being more varied than at any other station. The first cultch was planted about the end of April, 1906, and additional sections of the bottom were planted on the last of May and early in July of the same year. The results were such as to discourage further work, and after a final examination of the beds in April, 1907, the experiment was abandoned.

Oyster shells were deposited both broadcast and in small piles in proportions varying from 400 to 600 bushels to the acre, and after the lapse of about one month were found to be so densely covered with spat as to defy count, in many cases the small oysters being superimposed in several layers. At the end of two months many of the shells spread broadcast had become engulfed in the mud, but those still unburied bore large numbers of young oysters measuring between three-fourths and 1½ inches in length, with many smaller ones. The shells deposited in piles were still unburied in larger proportions, and all not covered by the mud, whether they were on the surface of the piles or in the interior, bore an average of about 35 young oysters, each ranging from one-half inch to over 1½ inches long. In April, 1907, practically all of these shells, both those spread broadcast and those planted in piles, were buried in the mud. Only 4 or 5 shells, of those planted in piles, were recovered, and these bore 7 oysters, the largest of which was 2¾ inches long.

Other shells were planted on a flooring of palmetto leaves, on the supposition that the fibrous matter of the latter would resist decay and serve as a mattress to prevent the sinking of the shells. Though this experiment was by no means a success the results were the best attained in this locality, and after the lapse of a year a few oysters measuring 1¼ to 3¾ inches long were recovered from the bed. It is possible that in the remote future, when it may be advisable to utilize the very soft bottoms of Terrebonne Parish, some modification of this method may be of value, but it has no present utility. Several plantings were made of palmetto leaves and brush thrust by their stems into the mud. It was hoped that these materials would hold together long enough to yield marketable oysters and that the vegetable fragments and oysters falling to the bottom would eventually stiffen the consistency of the surface mud and make a firm foundation for future operations. The strike on these materials, especially on

the palmetto, was enormous in quantity. At the end of the first month there were over 800 oysters between one-eighth and one-half inch long on each leaf and there were probably over three times that many smaller spat. One month later, however, practically all of these had dropped off and had become lost in the mud, while the few still attached fell away at the slightest touch. After the lapse of a year no trace of oysters was to be found, the brush had become covered with slime and more or less rotten, while the palmetto was reduced to a few wisps of fiber still attached to the stem and a small mass of decayed material on the bottom.

The foregoing experiments exhausted the list of cultch materials available at this place, and in view of the results the work was abandoned. It is believed that the hopelessness of the attempt to use at present the very soft bottoms in this vicinity has been demonstrated. They undoubtedly can be made available for oyster culture by the use of large quantities of sand or shells to form an artificial firm surface, but such materials would have to be transported long distances and the expense would be at present prohibitive, especially in view of the area of naturally more favorable bottom to be found in adjacent waters. That a prolific strike occurs in this region was shown and it is probable that it can be depended on yearly. It was also demonstrated, by the few surviving oysters, that the conditions are favorable for very rapid growth.

PELICAN LAKE.

After the abandonment of the plantation at Seabreeze, experiments were begun at Pelican Lake, on the recommendation of the state oyster commission. Large operations in planting seed oysters from the natural beds had recently been undertaken by a company at Houma, and it appeared desirable to determine whether the method of cultch planting to catch a strike of young oysters was feasible. The location also appeared to have some advantage from the presence of a watchman to prevent depredations and the destruction of the boundary marks, but the expectations in this respect were not realized.

Pelican Lake is a somewhat quadrangular body of water lying northwest of Lake Pelto, with which it communicates through Bay Rond and connecting bayous. At its southwestern corner it is connected with Wilson Bay and on its northern and northeastern borders are the mouths of several considerable bayous. The bay has an area of 5 or 6 square miles and a depth, toward the middle, of about 6 or 7 feet, gradually shoaling to 3 or 4 feet closer to the shores. There are strong currents near the entrances of Wilson Bay and Bayou Go-to-Hell, but in the greater part of the lake they are sluggish.

The salinity of the water is rather high, the specific gravity ranging, during the three years in which it was under observation, between 1.0136 and 1.0209, the average of all observations, 34 in number,

being 1.0167. The salinity is least in spring and summer and greatest in December and January. The bottom of the greater part of the lake is composed of soft mud, but there is a fringe of moderately hard bottom extending around most of the rim for a distance of several hundred yards from the shore. Near the entrance to Wilson Bay and at several other places in the southern part of Pelican Lake there are hard areas of limited extent occupying, apparently, the sites of extinct oyster beds. Oyster planting is at present confined to the littoral fringe of moderately hard bottom, and although the soft bottoms of the center of the lake eventually may be utilized, their preparation would involve an expense so considerable as to prevent their occupation until the naturally more suitable bottoms are more fully occupied.

In oyster food Pelican Lake is richer than any waters between there and Barataria Bay, with the single exception of Timbalier Bay, with which it is about on a parity. In this respect, however, it is inferior to the sites of the experimental plants at Falsemouth Bay, Bay Tambour, and Bayou St. Denis, but is superior to Three-mile Bay and Seabreeze. The most prolific waters are in the northern part of the lake, where the influence of the strong currents in Bayou Go-to-Hell is experienced, the region close to Wilson Pass, also a locality with strong currents, being fair. The fluctuations in the food supply, the specific gravities, and the temperatures of the water, observed at various times during the course of the investigations, are shown in the following table. In most cases the data recorded are the averages of several observations made practically simultaneously in different parts of the lake.

FOOD CONTENT, SPECIFIC GRAVITY, AND TEMPERATURE OF WATER AT PELICAN LAKE.

Date.	Specific gravity.	Temperature.	Food organisms per liter of water.	
			Number.	Volume.
1906.		°F.		Cu. mm.
June 6	1.0180	83.5	10,900	0.119
July 8	1.0154	....	4,125	.077
August 20	1.0204	84	9,000	.128
November 7	1.0205	70.7	12,875	.302
1907.				
January 17	1.0209	73	1,800	.082
April 20	1.0180	68	3,600	.193
May 9	1.0170	77.9	10,250	.409
10	1.0156	73.4	8,500	.312
29	1.0150	77	7,325	.313
June 30	1.0168	86.6	2,850	.077
July 23	1.0145	87.3	2,650	.135
December 7	1.0169	58	19,500	.943
1908.				
April 15	1.0154	79.5	36,000	.561
June 16	1.0171	83	5,000	.235
Average	1.0172	....	9,598	.277

The drumfish is reputed to cause some damage in these waters and it is said that 5 per cent of the seed oysters planted are killed by it. There were formerly several natural oyster beds, but they are now wholly extinct, and it is stated that they have been unproductive for about twenty years. It is believed that the extinction of these beds is due largely to the great numbers of borers found in the lake. During the progress of the experiments hereafter recounted practically all of the young oysters were killed by these industrious enemies, and it may be fairly assumed that the same conditions obtained on the original natural beds. With the majority of the spat being killed in this manner and the adults being taken by the oystermen, the utter extermination of the beds was practically inevitable. It is possible, also, that the water has increased in salinity, and, therefore, has become more favorable to the borers, through the improvement of the levee system and the consequent changes in drainage. We have no evidence that this is the case in the region under discussion, but it is undoubtedly true in certain localities to the eastward already mentioned. The experiments in Pelican Lake were conducted on five sites, three in the northern part of the bay and two in the southern half. The characteristics of the several localities planted are as follows:

Bed A.—North of the mouth of California Pass. Bottom soft. Currents moderately strong.

Bed B.—West of the mouth of Bayou Go-to-Hell. Bottom moderately hard. Currents strong.

Bed C.—On the west side of the lake about halfway between the preceding and Wilson Pass. Bottom moderately hard. Currents not noted.

Bed D.—East of the mouth of Wilson Pass. Bottom hard, on edge of extinct reef. Currents of moderate strength.

Bed E.—South of the mouth of California Pass. Bottom soft. Currents moderate.

On all of these the mud, as shown by mechanical tests with the mud-sounding machine, was sufficiently firm to warrant planting without previous preparation of the bottom.

Planting of oyster shells spread broadcast were made on each of these beds in May and June, 1907, and, in addition, on bed E in April, 1908, in quantities varying from 600 to 900 bushels per acre. No experiments were made in planting seed oysters, as that method was already under trial on a large commercial scale.

On May 9, 1907, a single planting was made on bed B, and on June 30 every shell was found to bear spat about one-half inch long, while on the same date sections of this bed and bed A, planted on May 27 and 29, had spat on from 25 to 45 per cent of the shells. Sections on beds C and D, in the southern part of the lake, planted on the same

dates, were practically devoid of living spat, although there were a few dead ones bearing evidence of having been killed by borers.

In April, 1908, when the beds were examined all sections of bed A were devoid of young oysters. On bed B every shell tonged bore numerous spat killed by borers, but there were among them a few young live oysters from 1 to 1½ inches long. Bed D was entirely exterminated so far as living oysters were concerned, and the shells were much corroded by the yellow boring sponge, which produces the condition which the oystermen term "worm-eaten."

On the section of bed E planted June 30, 1907, about 40 per cent of the shells bore, each, one or two oysters about 1 to 2 inches long in the following year, but an adjoining section planted in April, 1908, had a heavy set of spat entirely killed by borers when examined in June.

On the seed oysters which had been planted in this lake there are a very small growth of spat, much boring sponge, and many borers. This seed was obtained largely from Pointe au Fer Reef at the mouth of the Atchafalaya River; it was very rough and mixed with débris, and no effort appears to have been made to cull it or even to break up the larger bunches. In consequence the oysters now on the beds are badly clustered and crowded, to the detriment of both shape and condition. When last examined in January, 1909, they were of large size, averaging, as taken from the beds, about 150 per bushel, and they were plump but watery in appearance.

It is probable that Pelican Lake would prove an excellent place for growing oysters if clean, properly culled seed were used, and if it were not planted too densely. The margin only of the lake is fit to use in its unimproved condition, but the soft mud in the middle should serve as a good nursery for oyster food, the supply of which, in the lake at large, is good. On the other hand, as shown by the experiments just recounted, it would be futile to attempt to raise oysters from spat caught on planted shells or other cultch, owing to the favorable environment which the high salinity of the water furnishes to the borer. It is probable that the numbers of this destructive pest have been greatly augmented by the accessions to those naturally present brought in with the rough seed from the natural reefs, although, both from its location and its repute, it is not believed that Pointe au Fer is especially pernicious in this respect.

OYSTER FOOD.

In certain parts of the Louisiana coast oystermen and planters have encountered the difficulty frequent in all oyster-producing waters, the constant or occasional failure of the oysters to fatten. In Three-mile Bay and some of the adjacent waters, in Bay Adam and vicinity,

and at various places in Terrebonne Parish, this difficulty has become a serious impediment to oyster culture.

In some cases the trouble is undoubtedly due to the overcrowding of oysters on the planted beds or to the planting of such extensive areas that the total oyster population of the region affected is in excess of the number for which the waters are able to furnish an ample food supply. In any given body of water, under fixed conditions of drainage and tidal flow, there is probably a more or less fixed limit to the production of the minute plants on which oysters feed, and a correlated limit to the number of oysters that can be produced for the market. Where this limit is exceeded either by planting densely over a small area or more sparsely over an extensive one, especially in an inclosed body of water, the result is manifested in the poor condition of the product. This is not a theory, but a demonstrated fact, analogous to overgrazing of cattle on pasture lands, and must be given consideration by the successful oyster culturist. The same condition is induced by a heavy growth of mussels and other organisms whose food is the same as the oysters.

There are, however, other cases of failure of oysters to fatten which are not so well understood. Regions formerly favorable sometimes entirely cease to produce marketable oysters, even where there has occurred no material change in the density and distribution of the oyster population. In such instances it often happens that there has been some coincident sudden or gradual change in the drainage or in the tidal flows.

Something of this nature seems to have occurred in the vicinity of Bay Adam, where practically no fat oysters are now produced, though we were informed that in former years good oysters were grown regularly. Coincidently with this change in conditions, the rice fields draining into the bay went out of production. It is the opinion of some of the oyster planters that the two occurrences were causally related, and the authors concur as to the probable truth of this explanation. Undoubtedly the drainage from the rice fields carried with it considerable quantities of the fertilizing salts required for the production of the microscopic plant food of the oyster, and since these enriching materials have been largely or entirely cut off the waters have become less fertile and productive. It has been proposed to correct this deficiency in several places by conducting fresh water to the oyster grounds from the Mississippi River through siphons such as were used in the irrigation of the rice fields. Whether or not this measure would afford effective relief is a matter of some doubt. It can hardly be questioned that much of the fertility of the waters formerly came from the organic and mineral matter carried from the rice fields themselves, and it is doubtful whether the river water itself carries organic matter in sufficient quantity to afford material

relief, heavily charged though it may be with suspended mineral particles and salts in solution.

More common phenomena of the oyster beds are the seasonal and irregularly periodical fluctuations in the condition of the oysters. In some years the oysters in certain regions may be fat and in other places poor, while at another time the conditions will be wholly reversed. Again seasons will occur when the oysters are poor almost everywhere without apparent reasons. That these fluctuations are immediately due to the relative abundance or scarcity of available food admits of but little doubt, but granting that the assumption be true the difficulty instead of being solved is merely shifted to a more remote cause. Is there an actual deficiency in the quantity of food organisms and if so, what are the chemical, physical, and biological causes producing it? Or is there an abundance of food merely unavailable on account of some peculiarity of its distribution?

The feeding of oysters has been studied for many years, both in this country and in Europe, but we still know very little concerning the subject, other than the mere nature of the food and the general anatomical means by which it is ingested. It is only within three years that it has been possible even approximately to estimate the comparative volumes of the food carried by the waters of different localities, and such data are available for but a few places, all previous results being too indefinite to be of any material value. Even with the methods at present employed the results are not justly comparable between various localities unless large numbers of observations are made embracing all average weather conditions; though in the case of neighboring localities, where the weather conditions may be assumed to be approximately the same, simultaneous or approximately simultaneous observations may be accepted as comparable.

It may be observed in the preceding tables, presented in the discussion of the experiments in oyster culture, that there is wide divergence in the number and volume of the food organisms present in the water at different times. In Pelican Lake, for instance, the number of diatoms and other food organisms varied between 1,800 and 36,000, while their volume ranged between 0.077 and 0.943 cubic millimeter per liter of water (a cubic millimeter is about equal to the volume of a cube measuring one twenty-fifth of an inch in diameter, and a liter is about $1\frac{1}{8}$ quarts). This divergence is due very largely to the varying state of the weather, the smaller results being as a rule obtained after and during periods of calm, while the higher ones were invariably observed at times when strong winds prevailed. The reason for this is readily understood. The water specimens for the determination of the food content are taken from the stratum lying between 2 and 12 inches of the bottom. Many of the or-

ganisms, especially the minute plants known as "diatoms," on which the oyster feeds, live habitually on or close to the bottom, from which they are lifted and transported mainly through the agency of waves and currents. Many of them possess feeble powers of locomotion, but these are practically negligible in most of the bottom-dwelling species. It is therefore obvious that when the water is agitated by heavy winds and the bottom is stirred, the food organisms which in calm weather lie more or less quiescent on the mud will become mingled with other sedimentary matter in suspension in the water and the quantity taken in the specimen will be vastly augmented. This accords with field observation and is confirmed by the correlation existing between the volume of the food and that of the sand and other sedimentary matter in the precipitate from the water specimens. When the food is much in excess of the average, ordinary sediment is likewise large in volume, and when it is at the minimum, inorganic matter is comparatively lacking.

At present there appears to be no accurate method by which these fluctuations in the sedimentary condition of the water may be taken into account in the study of the comparative values of different localities for purposes of oyster culture, the most that can be done being to indicate more or less indefinitely the general state of the weather at and immediately preceding the time at which the observations are made. If observations could be taken at each locality daily or at frequent intervals throughout the year, the average results attained in different places would be strictly comparable, for the methods employed show the quantity of food which is actually available to the oysters at the time of observation.

When the diatoms and other food organisms are lifted from the bottom through the mechanical effect of the waves it is almost certain that the oysters should profit. Therefore, although we have as yet no experimental data which would render the statement positive, it is extremely probable that the matter of wave action must be added to the numerous other factors entering into the food supply of oysters, and that a certain amount of agitation of the bottom favors fattening. A region subject to this phenomenon should accordingly be preferable to one not so subject, and a season of strong winds should be more favorable than one of prevailing calms or breezes so light as to leave the bottom wholly undisturbed. When we have accumulated more data on the subject it is not improbable that in some cases seasons in which oysters fail to fatten may be found to be characterized by the prevalence of light winds.

During the course of the experiments in oyster culture previously described an attempt was made to study the distribution of oyster food on the coast of Louisiana in the hope that facts could be garnered which would throw some light on the reasons for local and

seasonal differences in its quantity. It may be confessed at once that the results lead to no satisfactory conclusions, owing to the necessarily limited number of observations in most places and the accidental fluctuations introduced by the factor just discussed, though the data gathered will probably assist to a solution of the problem when considered in relation to experimental work now being carried on at other places. The accumulation of data is probably the most that can be attempted for several years to come.

During a period of thirty-three months 498 food determinations were made at 61 different stations. At most places observations were made but once or twice in each year, but at the experimental plants they were made more frequently. In the case of the latter there is perhaps some basis for comparison, but in most other places the number of observations was too small to be assumed to represent anything approaching average conditions. The following table shows the average quantity of food and the salinity of the water at all places in which five or more observations were made:

Average Quantity of Oyster Food in Various Louisiana Localities, Based on Five or More Determinations.

Locality.	Number of observations.	Average specific gravity of water.	Food organisms per liter of water.	
			Number.	Volume.
				Cu. mm.
Three-mile Bay	14	1.0064	5,675	0.177
Falsemouth Bay	13	1.0056	9,000	.342
Nine-mile Bay, south end	8	1.0076	7,200	.217
Treasure Bay	7	1.0102	6,630	.169
Big Mussel Bay	7	1.0119	7,000	.185
Saw Bay	7	1.0162	5,230	.192
Blind Bay	6	1.0174	4,270	.172
Caligo Bay	8	1.0181	10,160	.252
Black Bay	7	1.0160	7,900	.237
Long Bay	6	1.0160	6,725	.219
Cock Bay	8	1.0176	6,350	.166
American Bay	7	1.0184	6,900	.248
California Bay	7	1.0195	5,540	.189
Quarantine Bay	7	1.0190	8,640	.329
Bastien Bay	9	1.0117	4,890	.155
Bayou Cook	5	1.0112	7,060	.222
Bay Adam	26	1.0115	6,000	.120
Grand Bayou	11	1.0123	4,275	.126
Bay Sans-bois	9	1.0095	12,522	.320
Bay Baptiste	10	1.0107	7,525	.230
Bayou St. Denis	19	1.0090	10,460	.337
Barataria Bay (Quartelle)	11	1.0151	17,363	.580
Bayou Bruleau	10	1.0120	9,675	.241
Bayou Rigault	19	1.0157	9,250	.235
Grand Isle	48	1.0127	5,690	.195
Bay Tambour	19	1.0147	10,200	.295
Lake Raccoisi	9	1.0148	17,500	.211
Timbalier Bay	7	1.0160	7,000	.264
Lake Felicity	5	1.0169	6,600	.193
Seabreeze Factory	18	1.0164	5,675	.169
Lake Pelto	5	1.0182	5,600	.188
Pelican Lake	38	1.0167	12,600	.252

As the salinity depends upon the relative proportions of the admixture of fresh and salt waters, the specific gravity may be taken as an index of the degree to which a locality is influenced by the

discharge of fresh water from the land. A low specific gravity, such as obtains in Three-mile Bay and vicinity, indicates a close relation to land drainage, as compared with another locality, such as Caligo Bay, in which the specific gravity is high. If land drainage and its contained fertilizing salts are highly important, as we generally suppose, in stimulating the growth of oyster food, it would be expected, other things being equal, that a low specific gravity would be correlated with a high food content as compared with a high specific gravity in the same system of waters. An examination of the foregoing table exhibits no such relation between the salinities and the food contents of the waters, when the various connected waters are compared with others in the same system or chain. The authors have prepared tables showing the specific gravity and food content of the waters at various times in each of the localities enumerated in the foregoing table of averages, and these show the same apparent lack of correlation, a high food content occurring sometimes with a low and at other times with a high specific gravity in the same locality.

It is probable that these results are to be regarded as nonconclusive rather than as showing that a relationship does not exist. The uncontrolled factors, particularly the stirring up of the bottom by wave action, are too important to be disregarded and their influence can be overcome only, apparently, by making many more observations than were possible under the conditions of the present investigation. Deductions from work of this character, unless the observations can be carried on systematically almost daily throughout the year, are likely to be misleading, and the investigations of the oyster food of Louisiana waters can be regarded as shedding no light on the effects of introducing river water in such localities as Bay Adam with the purpose of improving the conditions for fattening oysters.

SUMMARY AND CONCLUSION.

The following epitomizes the results of the experiments and investigations of the oyster regions of Louisiana, east of the Atchafalaya River, between April, 1906, and January, 1909, and the deductions which the authors draw from their observations:

1. It is believed that the future of both the natural beds and oyster culture in Louisiana will be benefited by greater restrictions on the issuance of permits to take unculled oysters from the natural beds. A too general practice in this respect tends to the depletion of the natural beds of not only oysters, but the shells that are essential for their future prosperity, and at the same time has the effect of discouraging the planting of shells on leased bottoms.

2. A limited issuance of such permits to take unculled stock from designated beds which are known to be overcrowded or which are

subject to disaster from freshets would prove of benefit to the beds designated and to oyster culture in general. It would result in saving many thousand barrels of oysters which would otherwise die from the effects of fresh water and crowding or which would never reach a good marketable condition owing to starvation and suffocation from an overpopulation of the reefs.

3. Beds known to produce few or no marketable oysters on account of overcrowding should be temporarily set apart as seed beds, from which the planters may secure culled oysters for bedding purposes under the provisions of the present law permitting such oysters to be taken after the close of the regular season. The provision of the law permitting this practice in the waters east of the western boundary of Plaquemines Parish could be advantageously extended, under the restriction just stated, to other parts of the state.

4. It will prove of great advantage in the future and will avoid ultimate embarrassment and expense to both the state and the lessees of oyster bottom if some measure can be adopted to insure the reference of leasehold corners to permanent landmarks in such manner that disputed boundaries can be accurately redetermined. This suggestion may appear to be of but little present importance, but the experience of other states shows that ultimately it must be followed.

5. The results of the foregoing investigations, and observations made during their course, indicate that as a potential oyster-producing state Louisiana is not excelled, if equalled, by any other section of the country. Wherever experiments were conducted it was shown that there was an abundant strike of spat, and the indications are that this can be depended upon to occur yearly without fail, though in some cases it is often destroyed by the borer. This danger, however, is not to be feared in any place where the specific gravity of the water is less than 1.012—that is, where there is an admixture of about equal parts of salt and fresh water—and the seed-producing area of the state is therefore ample to support an immense planting industry. The Louisiana planter has consequently little to fear from the bugbear of his northern confrere, the occasional or frequent scarcity of seed.

6. The depth of water over most of the oyster-producing area of the state is so small as to minimize the cost of taking up the oysters, and the comparatively sheltered situation of much of the bottom suitable for oyster culture, and the mildness of the weather as compared with that encountered in more northern localities during the oyster season, allow the work to be prosecuted with less frequent interruptions and therefore more economically. The warmer temperature in spring and fall, however, tends somewhat to reduce the length of the season.

7. The configuration of the Louisiana coast, with its broad frontage of salt marshes, which will probably always preclude its occupation by a considerable population, renders the oyster grounds practically immune from dangerous sewage pollution, a consideration of vital importance to the consumer and of corresponding advantage to the producer of oysters.

8. The greater distance of the Louisiana coast from most of the larger centers of population is its chief disadvantage as compared with the oyster regions of the Middle Atlantic States. In respect to the growing population of the West, however, it labors under no such impediment to development, as is shown by the vast increase in the quantity of Louisiana oysters marketed since the enactment of the laws now in force.

9. The oyster food supply in the waters of Louisiana is generally good and the growth of oysters is rapid. As shown by the experiments previously described, good marketable oysters can be produced within two years of the time at which they attach to cultch, and a corresponding growth occurs in seed oysters. The oyster planter therefore reaps a quicker and larger return on his investment than he would in places where the growth is slower.

10. The results of the experiments show that a larger quantity of oysters can be grown per acre than can be produced in most places. On the small experimental beds at Falsemouth Bay, Three-mile Bay, and Bayou St. Denis there were, at least, upward of 1,000 standard bushels per acre at the end of two years from the time of planting the cultch, and it is understood that this quantity per acre is grown on planted beds in other parts of the state.

11. The area of bottom available for oyster culture is large, but it varies in the character of the oysters produced and consequently in the purposes for which they can be used. It is probable that in practically all places where the fresh water exceeds the salt water and the latter does not fall much below 20 per cent in the admixture, seed oysters can be raised on suitable bottom, either for transplanting to places more favorable for growth or for the production of market oysters in situ. Three-mile Bay and vicinity appears to be of the first sort and Falsemouth Bay and Bayou St. Denis fall in the second category. In places in which the salinity is higher than that described above, the salt water in the mixture being in excess of the fresh, seed oysters usually can not be produced in considerable quantities, not on account of the absence of a strike but because most of the spat is destroyed by drills. Such localities, of which Bay Tambour is a type, may often be excellent for producing market oysters from seed raised elsewhere.

12. The experiments at Three-mile Bay demonstrated the possibility of producing a heavy growth of oysters on planted shells, but

the strike was so prolific that they were badly clustered, of bad shape and so poor in quality that they were of small value for market purposes. Oysters planted commercially in contiguous waters were of the same character. To be of much value this growth would require culling, the breaking up of the clusters and replanting less densely, preferably on harder bottom than most of that in the vicinity, and where the currents are stronger and food more abundant. It is not certain that this would be commercially profitable under present conditions. The oysters at present raised in this vicinity are suitable for canning purposes only.

13. In Falsemouth Bay a good strike occurred throughout the spring and summer in the three consecutive years of the experiments. The oysters produced exhibited a rapid growth, were in small clusters, and produced 7 pints of perfectly drained meats per standard bushel, an equivalent of over a gallon as measured at the shucking houses. They were nearly all extra selects, and the locality appears to the authors to be especially valuable for the production of oysters for the raw trade. There is a large area of hard bottom in the bay, and while the quality of the oysters would probably deteriorate if it were all planted, a considerable proportion, especially near the openings of the bayous discharging into Mississippi Sound, could be planted with confidence of good results. The only drawback to the oysters raised on the experimental beds was that the shells were rather brittle and sometimes broke in shucking.

14. At Bayou St. Denis, in Barataria Bay, the oysters raised on the experimental beds from planted shells were as fine as any that are grown on the Atlantic coast. They grew rapidly, had round, deeply cupped, rather heavy shells, and were very fat. Owing to the thicker shells they produced proportionately less meat than the preceding, but "turned out" about 5½ pints, thoroughly drained, per bushel, an equivalent of about 7 pints shucking-house measurement. They were equal in quality to the famous "Lynnhaven Bays" of Virginia, which sell for $3 or more per bushel in the northern markets, and they can be produced in much larger quantity per acre. They are readily salable in the shell as barrel stock.

15. At Bay Tambour, on the contrary, while there is a good set, the young oysters are soon killed by the snail or borer. Seed oysters 2 inches or possibly not less than 1½ inches long appear to be immune. The seed oysters planted at this place grew rapidly and attained a condition little if any inferior to those at Bayou St. Denis. A considerable area of the southern part of Barataria Bay and the contiguous waters has similar characteristics and a number of leases have been taken in that vicinity since the beginning of the experiments. Nearly 100,000 standard bushels of excellent oysters were produced on planted beds in Barataria Bay as a whole in the season

1908–9, though previous to these experiments the region was totally unproductive.

16. At Seabreeze the attempt to discover a means of using excessively soft bottom was unsuccessful. It was demonstrated that a heavy strike occurs, but the salinity of the water is so high that it is probable that trouble with the borer would be encountered. The growth of oysters is rapid and seed planted on hard bottom in the vicinity should flourish.

17. At Pelican Lake a heavy strike occurs, but the spat are soon killed by borers. The region is fairly suitable for growing market oysters from seed, but the latter should be culled at least sufficiently to break up the larger clusters, and the seed should not be planted so densely as to be crowded when it has grown to marketable size.

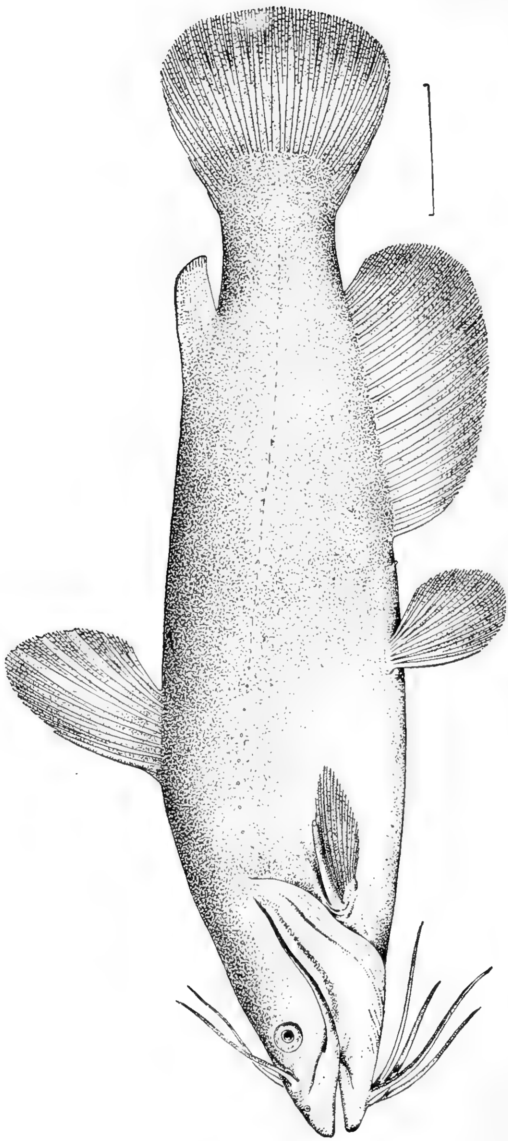
18. The oyster-food investigations carried on coincidently with the experimental work were inconclusive in demonstrating a relationship between the quantity of surface drainage water on the beds and the production of food organisms. They showed, however, that the latter are abundant in Louisiana as compared with most oyster regions.

AMERICAN CATFISHES: HABITS, CULTURE, AND COMMERCIAL IMPORTANCE

By William Converse Kendall,
Assistant, United States Bureau of Fisheries

Bureau of Fisheries Document No. 733

CONTENTS.



COMMON BULLHEAD (*Ameiurus nebulosus*).

AMERICAN CATFISHES: HABITS, CULTURE, AND COMMERCIAL IMPORTANCE.

By William Converse Kendall,
Assistant, United States Bureau of Fisheries.

IMPORTANT SPECIES.

The catfishes are of such commercial value as food that there have arisen extensive and almost special fisheries for them in the South, the Mississippi Valley, and the Great Lakes region; that is to say, in the centers of their greatest abundance. There is, however, very little published information on the habits of any species of catfish, and it has been thought desirable to bring together the most important published and otherwise available facts on this subject.

The fresh-water catfishes of the United States of more or less commercial importance may be classified in a popular way as channel cats (*Ictalurus*), mud cats (*Ameiurus*), yellow cats (*Leptops*), and stone cats (*Noturus*). This arrangement is not wholly satisfactory, however, owing to the confusion of the common names, for a mud cat of one locality may be the yellow cat of another, and the yellow cat here may be the stone cat somewhere else, etc.; then, too, there is no distinct line between channel cats and mud cats. The technical nomenclature and synonymy of these fishes are not in much better condition than the popular classification; therefore the discussion in the following pages will be more or less generic. Owing to the similarity of habits, moreover, it is unnecessary to discuss more than the most common forms except in a very general way.

The catfishes are a hardy race, very prolific, and in habits and structure comparatively safe from enemies. For these reasons wherever they occur they are usually very abundant. In late years, however, the demand for these fish has reached such dimensions that in some localities extensive inroads have been made upon their numbers and there has arisen the problem of how to repopulate the depleted waters. It has not, until recently at least, been considered necessary to resort to artificial propagation of catfishes, and there have been but few, if any, attempts in that direction. There are a few instances of pond culture, which will be referred to in another place.

Of about a dozen species appearing in the markets, probably not more than one-half are very common or merit more than passing

notice. The largest are the "great forked-tail cat" of the Mississippi (*Ictalurus furcatus*), the Great Lakes cat (*Ameiurus lacustris*), and the yellow cat (*Leptops olivaris*). The first attains a weight of 150 pounds, the second 100 pounds, and the others perhaps 50 pounds or more. Of the other cats the more important are the spotted cat (*Ictalurus punctatus*), Potomac channel cat or white catfish (*Ameiurus catus*), bullhead (*Ameiurus nebulosus*), and the marbled cat (*Ameiurus marmoratus*). Of less importance are the black bullhead (*Ameiurus melas*), yellow catfish or yellow bullhead (*Ameiurus natalis*), brown catfish (*Ameiurus platycephalus*), black catfish (*Ameiurus erebennus*), and the eel cat (*Ictalurus anguilla*).

Ameiurus marmoratus has heretofore usually been regarded as a variety of *A. nebulosus*, but the writer, basing his views on an examination of many individuals of both forms, believes the marbled cat is a distinct species. While for fish cultural purposes the name is not of much consequence, the distinctness of the two species, if a fact, is of considerable moment, as the marbled cat might and probably does require somewhat different treatment or methods of handling in pond culture. It may be said that there is considerable difference in structure, and supposed intergradation in color is assumed from the fact that some individuals of the common bullhead in their color markings (nebulations) somewhat resemble those of the marbled cat; and the marbled cat attains a much larger size than the common bullhead.

There are also two species of salt-water catfish, one of which, at least, in late years has attained some commercial importance. These are the gaff-topsail cat (*Felichthys marinus*) and the sea catfish (*Galeichthys milberti*). Their commercial importance is not great, but they doubtless form a portion of the records of the catfish fisheries.

Catfish are preeminently a poor man's fish. They not only afford him a cheap food fish, but become so abundant in time and there is so much demand for them that they support a paying industry, notwithstanding their cheapness. They may be raised in artificial ponds or in ponds unsuited to other fish. They propagate rapidly and prolifically and grow fast. There can be no objection to the introduction of them into waters unsuited to other fishes or in which other fishes do not occur, provided there is no danger of escape into waters where they would prove an undesirable acquisition.

HABITAT.

Almost any one of the species of catfishes seems to be adapted to a wide range of climatic conditions, although somewhat restricted to certain immediate surroundings. *Ameiurus lacustris* is supposed to be distributed from the Saskatchewan River and the Great Lakes

to Florida. *Ameiurus nebulosus* is found from Maine to Florida. In Maine, however, this species occurs as a rule only in muddy lakes and streams with plenty of vegetation and such portions of bodies of water of other character as afford those conditions, and apparently the fish do not stray far from home. Such localities are probably the warmest ones of the region. Regarding the local habitat of *Ameiurus nebulosus*, Dean says:[a]

It is one of the hardiest of fishes, will care for itself and even thrive in the muddiest of stagnant waters. It will breed readily and will endure complacently every hardship of drought, extremes of temperature, and lack of food.

Every trait of our catfish bespeaks its stagnant mud-loving nature; dusky in color, sluggish, and blundering, furnished with long and tactile barbels, a shallow, slowly drained pond, furnished with an occasional deep mud hole, will suit admirably the needs of the fish. If the water does become warm in the summer, the catfish will survive; knowing how to survive is one of its especial virtues. In a 3-foot aquarium at college about a dozen 9-inch catfish were kept during very warm weather, the room temperature often in the nineties and the water changed but once a day, with but few fatal results. Should the air supply in the water fail, trust the fish to care for itself. It will come to the surface, leisurely renew the air in its swim bladder, and even, frog-like or turtle-like, swallow air in bulk, trusting to stomach respiration. Of undoubted respiratory value, moreover, must be the scaleless, highly vascular skin, so important in the breathing economy of the frogs. Should the pond dry, and the whole pond basin be serried with mud cracks, the catfish will lie dormant for days, even for weeks. It has been found in a clod of mud, which served as a cocoon, until softened by the return of the water. In winter the catfish, like frogs, and unlike many of its neighbors, appears to hibernate. In November it becomes sluggish and refuses food, and early in December buries itself in the deepest ooze of the pond. It does not reappear till the first sharp thunderstorm in February or March. Then the fish are seen, thin and ravenous, approaching the shore so closely that their heads ripple the surface. So fearless are they in early spring in Central Park that they come in schools in shallow water and will take food almost from the hand.

Of this species Forbes and Richardson[b] say:

It is peculiar in its preference for stagnant waters, of both lowland and upland lakes and ponds, and it is next commonest in the larger streams.

According to Forbes and Richardson, the black bullhead (*Ameiurus melas*) in the main features of its distribution agrees with the yellow bullhead, being, like that species, decidedly most abundant in creeks and least so in the larger rivers, and also showing a notable preference for the more quiet and muddier parts of the streams it inhabits.

The channel cats are so called owing to their apparent preference for channels of streams and clearer, cleaner water than that affected by the majority of so-called mud cats, though the native channel cat of the Potomac River, according to our present classification, is generically a mud cat (*Ameiurus*). In some southern rivers, the St. Johns in particular, several genera of catfish occur together with precisely the same kind of surroundings, whether muddy or sandy.

---

[a] Dean, Bashford: Notes on the common catfish, Nineteenth Annual Report State Fish Commission, New York, 1890, p. 302.

[b] Forbes, S. A., and Richardson, R. E.: The fishes of Illinois. Natural History Survey of Illinois, vol. III, ch. CXXXI, 357 p., 1908.

The spotted cat (*Ictalurus punctatus*), previously mentioned as one of the most highly esteemed channel cats, thrives best in streams. Regarding this species Jordan[a] says:

> The channel cat abounds in all flowing streams from western New York westward to Montana and southward to Florida and Texas. It is perhaps most common in Tennessee, Arkansas, and Missouri. It seems to prefer running waters, and young and old are most abundant in gravelly shoals and ripples. The other catfishes prefer sluggish waters and mud bottoms. I have occasionally taken the channel cat in ponds and bayous, but such localities are apparently not their preference. They rarely enter small brooks unless these are clear and gravelly. Whether they will thrive in artificial ponds we can only know from experiment.

Forbes and Richardson (op. cit.) state of the spotted cat that it lives in clear, swift-flowing water, and for this reason and for the fact that it is a "trimmer" and more active fish than any of the related species, it is well esteemed by anglers in many localities.

Evermann (op. cit.) states that in Louisiana the blue cat (*Ictalurus furcatus*) and goujon (*Leptops olivaris*), called also yellow cat, are influenced in their movements by the temperature of the water. During the winter they come farther down the river, where the water is warmest, and in the summer they run farther upstream or retire to the deeper waters. The goujon is said to be most abundant in the Atchafalaya River from September to November, or until the fall floods begin, when it gradually disappears. This is the best season for catching, although a few may be found at any season. The best fishing for the blue cat, on the other hand, is said to be during the high water in the spring. These fish leave the rivers, lakes, and bayous and take to the woods. Good "woods" or "swamp" fishing is sometimes had as early as March.

The blue catfish of the Mississippi Valley and Southern States, as stated elsewhere, attains a weight of at least 150 pounds and is of considerable importance in that region. According to Forbes and Richardson (op. cit.), it frequents the deeper waters of the river channels, coming out into the river sloughs and backwaters in spring. The goujon is an abundant species in parts of the Mississippi basin and in the Gulf States, and is one of the most important catfishes in certain localities. Regarding this fish the same authors state that it is most abundant in the lower course of the larger streams, and in the bayous and overflow ponds of the lower Mississippi Valley.

Evermann states that the blue cat and the goujon are by far the most important species of the Atchafalaya River, Louisiana, and probably constitute 98 per cent of the entire catch. According to the same authority, the maximum size of the blue cat is about the same as that of the goujon. The largest of which Evermann

---

[a] Jordan, David Starr: The habits and the value for food of the American channel catfish (Ictalurus punctatus Rafinesque). Bull. U. S. Fish Commission, vol. v, 1885, p. 34.

heard weighed 100 pounds. The largest seen by him was a ripe female weighing 35 pounds. A spent female, 31 inches long, weighed 22 pounds and dressed 13 pounds. Another spent female, 30 inches long, weighed 17 pounds. The goujon, Evermann says, rarely reaches a weight of 100 pounds, but examples of 50 or 60 pounds weight are said to be not unusual. The largest individual seen by him was a ripe female 41 inches long and weighing 48 pounds. It dressed 27 pounds. One 38 inches long weighed 37 pounds and another 37 inches long weighed 36½ pounds.

The eel cat (*Ictalurus anguilla*) was first discovered in Louisiana by Evermann, but it was later found in the Ohio River at Louisville, Ky. Evermann states that it rarely weighs over 5 pounds and never over 8 pounds.

Large so-called eel cats in Texas were identified by Evermann as the blue cat (*Ictalurus furcatus*). More recently Forbes and Richardson record the eel cat in Illinois, and report that H. L. Ashcock, of Alton, says that fishes of this species weighing 26 pounds are taken at Alton and Grafton, where they are sometimes called "niggerlips" by the fishermen.

Of the four commercial catfishes taken in the Atchafalaya River, Louisiana—viz, blue cat, goujon, eel cat, and spotted cat—the eel cat stands third in commercial importance, Evermann states, the relative importance of the others being in the order enumerated.

The yellow catfish (*Ameiurus natalis*) ranges from the Great Lakes region to Virginia and Texas. It is abundant in many places and doubtless appears in the markets with others of its congeners.

According to Smith,[a] the brown catfish (*Ameiurus platycephalus*) has a restricted range, embracing only the streams from Cape Fear River to the Chattahoochee. Its maximum length is somewhat over 1 foot. It is abundant in some places and is largely used as food. Its commercial importance, however, owing to its restricted distribution, is doubtless limited.

The black catfish (*Ameiurus erebennus*) inhabits coastwise waters from New Jersey to Florida, having a maximum length of about 1 foot. In Florida, especially in the St. Johns River, it is one of the important catfishes.

Smith says (op. cit.) regarding the white catfish (*Ameiurus catus*):

> This species, whose form and color vary with age and environment, inhabits coastwise fresh waters from New Jersey to Texas. * * * The maximum length is 2 feet. * * * As food, this is one of the best of the catfishes, although its commercial importance in North Carolina is comparatively slight, owing in part to the abundance of other desirable fishes and in part to the fact that most of the catfish are caught where shad, alewives, and striped bass are receiving special attention.

---

[a] Smith, H. M.: Fishes of North Carolina. North Carolina Geological and Natural History Survey, vol. II, 1907.

FOOD AND FEEDING HABITS.

The catfishes subsist upon either animal or vegetable food. In a strictly wild state the food is probably to a great extent animal, but in artificial inclosures they will eat almost any kind of vegetable matter fed to them.

Mr. J. F. Jones, of Hogansville, Ga., a correspondent of the Bureau of Fisheries quoted elsewhere (Bull. U. S. Fish Commission, vol. IV, 1884, p. 321), remarks regarding his domesticated catfish:

The species is easily tamed or domesticated. They can be trained like pigs—increase and grow fat when well supplied with food. They subsist upon vegetation, but in the absence of it can be fed upon any kind of fruit, such as peaches, apples, persimmons, watermelons, and the like, corn, wheat, and sorghum seed. I put fifty 3 inches long in a basket and set it in my pond. I fed them well on corn shorts and dough. In the short space of six weeks they grew to be 6 and 7 inches long and trebled in weight.

Regarding the "yellow bullhead" (*Ameiurus natalis*), Forbes and Richardson write:

The food and habits of this species and the brown bullhead are virtually identical. As illustrated by the food of a dozen specimens, this species has the habits of a scavenger. One of these fishes had gorged itself with the waste of a fish boat, and one had made the greater part of its last meal from the remnants of a dead cat. Three of these specimens had eaten fishes taken alive, and 4 others had eaten crawfishes. May-fly larvæ and a few water snails were the only other objects worth mentioning. Seven young specimens, from 2 to 3½ inches long, had fed principally on entomostraca, the remainder of their food being chiefly small mollusks and insect larvæ.

As to the food of the common bullhead (*A. nebulosus*), Forbes and Richardson state as follows:

The food of 13 specimens examined by us was unusually simple for that of a catfish, consisting chiefly of small bivalve mollusks, larvæ of insects taken upon the bottom, distillery slops, and accidental rubbish. One of the specimens had eaten 18 leeches, leeches appearing in the food of 4 others, and a few had taken terrestrial insects and univalve mollusks.

Jordan (loc. cit.) says *Ictalurus punctatus* is an omnivorous fish, though less greedy than its larger-mouthed relatives, and that it feeds on insects, crawfishes, worms, and small fishes, and readily takes the hook.

Forbes and Richardson say:

Our knowledge of its food is based upon an examination of 43 specimens taken from the Illinois and Mississippi rivers during the spring, summer, and autumn months of 1878, 1880, and 1887. About one-fourth of the food consisted of vegetable matter, much of it miscellaneous and accidental. Three specimens, however, had eaten nothing but algæ, and fragments of pond weed (*Potomogeton*) made 20 per cent of the food of another three. A single fish had fed on stillhouse slops; and a dead rat, pieces of ham, and other animal débris attested the easy-going appetite of this thrifty species.

Pieces of fish were found in all of this group, commonly, however, of so large a size as to make it certain that they were the débris of the fishing boats. Occasionally fishes, evidently taken alive, composed the whole food. Mollusks, about equally large

water snails and large thin clams (probably in most cases *Anodonta*) were a decidedly important element, being found in 15 of the 43 fishes. They amounted to 15 per cent of the food of the group, and several specimens had taken little or nothing else. Notwithstanding the number of bivalves eaten by this fish, no fragment of a shell was ever found in their stomachs, but the bodies of the mollusks seem to have been separated, while yet living, from the shells, as indicated by their fresh condition and by the fact that the shell muscles were scarcely ever present. Fishermen say that they are often first notified of the presence of catfishes in their seines by seeing fragments of clams floating on the surface, disgorged by the struggling captives. Still more interesting and curious is the fact that the spiral-shelled mollusks found in the stomachs of these fishes were almost invariably naked, the more or less mutilated bodies having only the opercles attached. The shells are evidently cracked in the jaws of the fish and rejected before the food is swallowed. As many as 120 bodies and opercles of water snails (*Melantho* and *Vivipara*) were taken by us from the stomach of a single Illinois River catfish. Insects were, however, a principal food of the specimens studied, making 44 per cent of all, and eaten by 28 fishes. Five, in fact, had eaten nothing else, and others had taken 90 per cent or more of insects, mostly aquatic, although now and then a fish had filled itself with terrestrial specimens. Most of the aquatic insects were larvæ of mayflies, dragon flies, and gnats, to be found only on the bottom. Our records indicate that this fish spawned in May in 1898 (Craig). The spawning season in the Wabash is said by Doctor Jordan to begin in June. * * *

The channel cat is taken very frequently in bait nets and baskets, the former being called by the fishermen "fiddler nets." These are baited usually with "dough balls," made by mixing flour and water, allowing the paste to sour, and then baking it; or, in summer, with roasting ears of corn which become sour after soaking in water for a day or so. The sour smell of either the dough or the corn is said to be especially attractive to this fish.

In some localities the mud cats swarm about the mouths of sewers and other places, where they obtain refuse and offal. This garbage-eating habit is, however, not confined to the mud cats, the channel cats also occasionally indulging their tastes in that direction. Slops from the galley and refuse from the toilet rooms of the *Fish Hawk* in the St. Johns River, Florida, formed a great attraction for the two principal catfishes of that region (*Ameiurus catus?* and *Ictalurus punctatus*). It is doubtful whether the food, however foul, taints the flesh in any way, and this allusion to some apparently disgusting feeding habits can not consistently lead anyone who is fond of pork or chicken to forego the catfish solely on this account. Besides it is only occasionally and locally that these fish have access to such food.

Mr. Charles Hiester[a] says that catfish appear to live on the larvæ of insects and on flies that fall into the water. "They never jump out of the water."

Writing of *Ameiurus nebulosus*, Dean (loc. cit.) says:

The habits of the catfish make it a most objectionable neighbor. * * * The stomach contents show its destructiveness to fish eggs and to young fish. * * * It will eat incessantly, day and night, prowling along the bottom with barbels widely spread. It will suddenly pause, sink headforemost in the mud for some unseen prey. Nor is it fastidious in its diet, "from an angleworm to a piece of tin tomato can," it bolts them all. From the contents of miscellaneous catfish stomachs, however, there

[a] Letter in Bull. U. S. Fish Commission, vol. II, 1882, p. 76–77.

appears to exist a general preference for fish food. Professor Goode has already noted the attractiveness of salt mackerel or herring bait. He has, moreover, hinted incidentally that the fish will not bite when an east wind is blowing. It is in order to procure food in a lazy and strategic way that the catfish has been seen to sink in the mud with but barbels and dusky forehead exposed, ready to rush out and swallow the unwary prey.

In the Atchafalaya River region in Louisiana, Evermann says the impression prevails among the fishermen that the blue cat and goujon run out over the flooded districts on account of the more abundant food supply to be found there, which consists chiefly of crawfish inhabiting the shallow pools and ponds made accessible to the catfish through the agency of the floods. He further states that the goujon is more voracious than the blue cat, and large individuals are apt to feed upon smaller blue cats when confined in the same car. To prevent this, it is said that the fishermen sometimes sew up with wires the mouths of the very large goujon.

According to Forbes and Richardson the goujon lives and feeds on or near the bottom, and the fishermen at Havana, Ill., say that they frequently find it in hollow logs; that fishes are so far as known its principal food, and among those eaten by it they had observed a common river sunfish (*Lepomis*), several minnows, and a bullhead.

Regarding the blue cat the same authors state that a specimen examined by Kofoid had eaten fragments of bark (20 per cent), insect fragments and larvæ (50 per cent), and miscellaneous organic débris, and the senior author found fishes only in the stomach of a specimen taken in 1887.

In their feeding habits all species of catfish seem to be more or less nocturnal. They take a hook most readily from about twilight on into the night. Most set-line fishing is carried on at night. Moonlit nights, however, are more favorable than dark ones. On the St. Johns River it was noticed that the fish would begin to rise shortly after sunset, in large numbers, and the sound of their "breaks" could be heard in all directions, although a lot of garbage thrown overboard would not fail to raise more or less of them during the day. The catfish here were wary of a baited hook, and although freely eating of pieces of bread or meat floating at the surface, would never touch this if a hook and line were attached. Yet a hook baited with meat or fish and sunk would usually be satisfactorily effective, especially if "bream" (*Lepomis*) began to bite first. The presence of other more readily biting fish seemed to attract the catfish and render them bolder. Large catfish would take a small baited "bream" hook much more quickly than they would a large hook. The mud cat here bit no more greedily than the channel cat. It might be well to state in this connection that the channel cats (*Ictalurus punctatus* and *Ictalurus furcatus*) are sufficiently game fighters to give an angler

not too fastidious a very satisfactory battle. These two species might justly be classed as game fishes.

In northern lakes and streams the bullhead or hornpout does not always seem to be so wily as the southern catfishes were usually during the daytime. Although the best time to angle for hornpout is about dusk or after dark, they are not infrequently caught in the daytime, much to the annoyance of the "still fisher" for black bass, pickerel, and other fishes. When bullheads begin to bite, if other fish are desired, it is necessary to seek another place. They will take live-fish or dead-fish bait or frogs with equal readiness. If, however, bullheads are wanted, angleworms are the best bait.

SPAWN-EATING HABITS.

Dean has referred to the fish-egg-eating propensity of *Ameiurus nebulosus*. This species is not alone in its ovivorous habit. A seine haul on the Potomac River was estimated to contain about 10,000 catfish (*Ameiurus catus* and *Ameiurus nebulosus*), a large number of which were opened and their stomach contents examined. The fish were found to have been feeding almost exclusively upon herring (*Pomolobus*) eggs, to such an extent that their stomachs were distended with the food. Mr. L. G. Harron, at whose fishery this observation was made, told the writer that although these large hauls were not frequent, occasionally much larger ones were made. In Albemarle Sound, during one shad season, the writer frequently found catfish full of shad roe, but catfish were not abundant at this time.

Writing of the white catfish Smith says:

> During the spring fishing season, many are caught in seines hauled for shad and alewives, especially the night hauls on the flats. The species resort to the shad spawning grounds to feed on the eggs, and must be enormously destructive in this way. On April 24, 1899, at Capehart's shad fishery at Avoca, not less than 5,000 white catfish, from 6 to 24 inches long, were caught at one evening haul, and these were without exception absolutely gorged with shad spawn, so that their bellies were distended like balloons. Schools of alewives are followed to their spawning grounds by droves of catfish, which feed on the eggs. The spawn of white perch, yellow perch, and other species is also extensively consumed by this catfish.

Forbes and Richardson say:

> The charge of spawn-eating has frequently been preferred against this fish (*A. nebulosus*) as well as its near relatives, especially by the whitefish and shad culturists. The evidence for such a view is, however, scanty.

Under the heading "Salmon not injured by catfish," in the Bulletin of the United States Fish Commission, volume VII, 1887, page 56, Mr. Horace Dunn makes the statement:

> Word has gone out that catfish have been taken in Suisun Bay [California] whose stomachs were full of young fish and salmon spawn. Upon this statement the cry has been made that the catfish were destroying both spawn and young salmon. The facts

of the case are that the catfish were caught in the vicinity of a salmon cannery, and that the spawn was among the fish offal thrown into the bay, and the young fish were "split-tails" and not valuable for food purposes.

The facts of the case as stated do not prove that catfish may not be injurious to salmon. The chances are that if they would eat salmon spawn as offal, and living "split-tails," they would eat naturally deposited spawn and young salmon of the "split-tail" size if they had access to them.

Smith says:[a]

The catfish have a reputation among the California fishermen of being large consumers of fry and eggs of salmon, sturgeon, shad, and other fishes. This accords with their known habits in other waters. Mr. Alexander's examination, however, of the contents of several hundred stomachs of catfish in California and Oregon yielded only negative results as to the presence of young fish and ova. Writing of the bullhead in Clear Lake, California, Jordan and Gilbert say that it is extremely abundant and is destructive to the spawn of other species. The scarcity of the valuable Sacramento perch in that lake, which they attribute to the carp, here as in the Sacramento River, may be partly due to the more numerous catfish, which feed almost exclusively on animal matter.

BREEDING HABITS.

Probably less is actually known of the breeding habits of most of the species of catfishes than of their other habits, yet observations have been made upon two or more species with sufficient detail to warrant the assumption that in the main the habits of most species are essentially alike. Speaking of *Ictalurus punctatus*, Jordan says that it spawns in the spring, but that its breeding habits have not been studied. Mr. Jones (loc. cit.) says this species spawns when 1 year old, and twice a year—in May and in September. In the preceding spring he procured eight wild ones. After feeding them well up to this time (October 31), they had spawned in May and September and filled his pond. He says that they take care of their own young and trouble no other fish.

Ryder[b] thus describes the breeding process of a pair of Potomac channel cats (*Ameiurus catus*) in the aquarium at Washington:

A number of adult individuals of *Ameiurus albidus* were brought from the Potomac River to the Armory building at the instance of Lieut. W. C. Babcock, U. S. Navy, and Colonel McDonald, and deposited in the large tank aquaria of that institution about the close of the shad-fishing season of 1883. One pair of these have since bred or spawned in confinement, and thus afforded the writer the opportunity of observing and describing some of the more interesting phases of the development of this singular and interesting family of fishes. * * * Its habits of spawning and care of the young are probably common to all the species of the genus, and are quite remarkable as will appear from the subjoined account.

On the morning of the 13th of July, a little after 10 o'clock, we noticed a mass of whitish eggs in one of our aquaria inhabited by three adult specimens of *Ameiurus albidus*,

---

[a] Smith, H. M.: A review of the history and results of attempts to acclimatize fishes and other water animals in the Pacific States. Bull. U. S. Fish Commission, vol. xv, 1895, p. 387.

[b] Ryder, John A.: Preliminary notice of the development and breeding habits of the Potomac catfish, Ameiurus albidus (Le Sueur) Gill. Bull. U. S. Fish Commission, vol. III, 1883, p. 225.

two of which were unmistakably the parents of the brood, for the reason that they did not permit the third one to approach near the mass of eggs, which one of them was watching vigilantly. One of the individuals remained constantly over the eggs, agitating the water over them with its anal, ventral, and pectoral fins. This one subsequently proved to be the male, not the female, as was at first supposed. The female, after the eggs were laid, seemed to take no further interest in them, the whole duty of renewing and forcing the water through the mass of adherent ova devolving upon the male, who was most assiduous in this duty until the young had escaped from the egg membranes. During all this time, or about a week, the male was never seen to abandon his post, nor did it seem that he much cared even afterwards to leave the scene where he had so faithfully labored to bring forth from the eggs the brood left in his charge by his apparently careless spouse. The male measured 15 inches in length, the female one-fourth inch more.

The mass of ova deposited by the female in a corner and at one end of the slate bottom of the aquarium measured about 8 inches in length and 4 inches in width, and was nowhere much over one-half to three-fourths of an inch in thickness. The ova were covered over with an adhesive, but not gelatinous, outer envelope, so that they were adherent to the bottom of the aquarium and to each other where their spherical surfaces came in contact, and consequently had intervening spaces for the free passage of water, such as would be found in a submerged pile of shot or other spherical bodies. It was evident that the male was forcing fresh water through this mass by hovering over it and vibrating the anal, ventral, and pectoral fins rapidly. There were probably 2,000 ova in the whole mass, as nearly as could be estimated. All of those left in the care of the male came out, while one-half of the mass which he had detached from the bottom of the aquarium on the third day, during some of his vigorous efforts at changing the water, were transferred to another aquarium, supplied with running water, and left to themselves. Those which were hatched by the artificial means just described did not come out as well as those under natural conditions. Nearly one-half failed to hatch, apparently because they were not agitated so as to force fresh water among them and kept clean by the attention of the male parent. * * * When first hatched, on the sixth to eighth day, the young exhibited a tendency to bank up or school together like young salmon. They also, like young salmon, tended to face or swim against the current in the aquarium, a habit common, in fact, to most young fishes recently hatched. * * *

On the fifteenth day after oviposture it was found that they would feed. While debating what we should provide for them, Mr. J. E. Brown threw some pieces of fresh liver into the aquarium, which they devoured with avidity. It was now evident that they were provided with teeth, as they would pull and tug at the fragments of liver with the most dogged perseverance and apparent ferocity. This experiment showed that the right kind of food had been supplied, and, as they have up to this time (August) been fed upon nothing else, without our losing a single one, nothing more seems to be required with which to feed them.

It is worthy of note that when pieces of liver were thrown into the aquarium the parent fishes would apparently often swallow them, with numbers of young ones eating at and hanging to the fragments. I was soon agreeably surprised to find that the parent fishes seemed to swallow only the meat, and that they invariably ejected the young fish from the mouth quite uninjured, the parent fish seeming to be able to discriminate instinctively, before deglutition occurred, between what were its proper food and what were its own young. As soon as the young began to feed they commenced to disperse through the water and all parts of the aquarium, and to manifest less desire to congregate in schools near the male, who also abated his habit of fanning the young with his fins, as was his wont during the early phases of development.

45738°—10——3

Regarding the breeding habits of *Ameiurus nebulosus*, Dean (loc. cit.) says:

In breeding habits the catfish still maintains its reputation for hardiness. It spawns rapidly, even when transferred to aquaria. The eggs are one-eighth inch in diameter and are adhesive, reminding one somewhat of frog spawn. The mass is deposited in shallows where the bottom is sufficiently hard to support its weight. The danger to the egg occasioned by stagnancy or muddiness of the water is carefully provided for; the male, standing guard, forces the water slowly through them. In some of the southern species, for thorough aeration, the male turns to account the operation of breathing, filling the back of the mouth often so full of eggs that the whole face and throat are distended. In the neighborhood of New York the spawning season is in the early part of April, and appears to last about a fortnight. Toward the latter part of the month the females go into deeper water. At this season (Central Park) of a dozen fish caught, ten proved to be males.

A similarity of breeding habits in *Ameiurus nebulosus* and *Ameiurus catus* is shown by comparing with the preceding record of Ryder the observations[a] presented in a paper by Dr. H. M. Smith before the American Association for the Advancement of Science, and noticed[b] in Science (Feb. 13, 1903, p. 243). Smith observed:

A pair of fish from the Potomac River in the Fish Commission aquarium at Washington *made a nest on July 3*,[c] 1902, by removing in their mouths upward of a gallon of gravel from *one end of the tank, leaving the slate bottom bare. On July 5 about 2,000 eggs, in four separate agglutinated* clusters, were deposited between *10 and 11 a. m.* on the scrupulously clean bottom. *Ninety-nine per cent hatched in five days* in a mean water temperature of 77° F. The young remained on the bottom *in dense masses* until 6 days old, when they began to swim, at first rising vertically a few inches and immediately falling back. By the end of the seventh day they were swimming actively, and most of them *collected in a school* just beneath the surface, where they remained for two days, afterwards scattering. They first ate finely ground liver on the sixth, and fed ravenously after the eighth day. The fish were 4 millimeters long when hatched, and grew rapidly, some being 18 millimeters long on the eleventh day, and at the end of two months their average length was 50 millimeters. Both parents were very zealous in caring for the eggs, *keeping them agitated constantly by a gentle fanning motion of the lower fins.* The most striking act in the care of the eggs was the sucking of the egg masses into the mouth and the blowing of them out with some force. The fanning and mouthing operations were continued with the fry until they swam freely, when the care of the young may be said to have ceased. During the first few days after hatching, the fry, banked in the corners of the tank, were at irregular intervals actively stirred by the barbels of the parents, *usually the male.* The predaceous feeding habits of the old fish gradually overcame the parental instinct; the tendency to suck the fry into their mouths continued, and the inclination to spit them out diminished, so that the number of young dwindled daily, and the 500 that had been left with their parents had completely disappeared in six weeks, although other food was liberally supplied.

In Sebago Lake, Maine, in a shallow, sandy pool, on July 6, the writer observed one catfish (*Ameiurus nebulosus*), sex undeter-

---

[a] See also Eycleshymer, A. C., Observations on the breeding habits of Ameiurus nebulosus, American Naturalist, November, 1901, p. 911.

[b] For the complete account see Smith, H. M., and Harron, L. G., Breeding habits of the yellow catfish. Bull. U. S. Fish Commission, vol. XXII, 1902, p. 151–154.

[c] Italics by the writer to show close similarity to Ryder's observations.

mined, with a brood of young thickly clustering under it, in the manner previously described. From Smith's observations, they might have been 8 or 10 days old; from Ryder's, about 15 days of age. They were about 12 millimeters long. The development doubtless would be somewhat retarded in the cooler waters of this more northern latitude.

Forbes and Richardson describe the spawning habits of the "brown bullhead" (*A. nebulosus*) as follows:

> The brown bullhead spawns in spring, the time having been May in 1898 at Havana (Craig). Their nests were found by Professor Birge in shallow bays with sandy bottom 6 inches to 2 feet deep. The eggs are laid in masses similar to those of the frog and are of a beautiful cream color.

Regarding the spawning habits of the "yellow bullhead" (*Ameiurus natalis*) Forbes and Richardson say:

> The yellow bullhead spawned at Havana in May in 1898 (Craig). Females with ripe spawn were seen in the market at Meredosia on May 24, 1900 (large).

According to Smith, the spawning of the white catfish in North Carolina occurs in summer, and the spawning habits appear to be quite similar to those of the bullhead.[a]

Regarding the spawning season of the blue catfish in Louisiana, Evermann says:

> So far as the investigations of a single season may be relied upon, these results (referring to a table) indicate that the spawning season of the blue catfish in the Atchafalaya River is a prolonged one, but that the majority of the fish spawn in March and April.

Evermann states, regarding the goujon, that his investigation indicates that it has a somewhat later spawning season than the blue cat in the Atchafalaya River. Regarding the same species Forbes and Richardson state that, according to Havana fishermen, the spawning time in Illinois is in May or later.

FOOD QUALITIES.

In flavor and other edible qualities the catfishes differ somewhat among themselves. As a rule the channel cats, especially the spotted cat (*Ictalurus punctatus* and *I. furcatus*), seem to have a reputation for possessing more delectable qualities than the mud cats. This is possibly due to difference in habits and habitat.

Regarding *Ictalurus punctatus* Jordan says:

> As a food fish the channel cat is certainly better worthy of attention than any other American catfish. There is much less waste in the body of the channel cat than in

[a] There appears to be some evidence that the catfish identified by Ryder as the white catfish (*Ameiurus catus*) was possibly the bullhead (*Ameiurus nebulosus*). If such is the case, the similarity of habits previously described could be readily accounted for. The doubt thus arising indicates the necessity of observations upon the spawning habits of the white catfish.

other catfishes, as the latter lose more than half their weight by removal of the head, the entrails, and the skin. The flesh of the channel cat when fresh is very superior; it is white, crisp, and juicy, of excellent flavor, and not tough. It is much more delicate both in fiber and in flavor than that of the other catfishes. When well cooked, I consider it superior to that of the black bass, the wall-eye, the yellow perch, or any other percoid fishes. Among other fresh-water fishes it is inferior only to the whitefish, the trout, and other Salmonidæ.

Speaking of the blue cat (*Ictalurus furcatus*), Jordan and Evermann say:[a]

In spite of popular prejudice to the contrary, the flesh of this catfish is of excellent quality, firm and flaky, of very delicious flavor, nutritious in a high degree, and always commanding a fair price.

Regarding the yellow cat or goujon, which they term the mud cat, the same authors state:[b]

Its flesh is of fine texture and of excellent flavor, and there is really no good reason for the prejudice against it which obtains in many localities. The fact that it is a large, rather repulsive-looking fish, not too cleanly in its habits, doubtless has something to do with this.

And in the previously cited report Evermann writes regarding the same fish:

It is by no means a handsome fish; but its great size, the excellence of its flesh, and its superior keeping qualities render it a very important food fish.

Forbes and Richardson say that this species is commonly regarded as one of the very best catfishes for food, the flesh being of a fine texture and an excellent flavor.

Mr. Charles Hiester[c] has written regarding *Ameiurus nebulosus* (?):

It is one of the very best of pan fishes and has no noticeable bones. It retains its excellence as fresh fish as long as any fish and longer than most of them. It is eaten and relished by all classes of people, and they would eat more if they could get them. It is not salted down, because the demand for fresh fish exceeds the supply. Its quality for table food will ever prevent its use for any other purpose.

The great popular demand testifies to the food virtues of the catfishes. By some persons the bullhead is preferred to the spotted cat and channel cat and by many it is considered their equal. It forms the fish part of the combination, "catfish and waffles," for which Philadelphia is famous.

Regarding the "yellow bullhead" (*A. natalis*) Forbes and Richardson say:

In the words of Doctor Jordan, these fishes are "small, but good eating," as we have ourselves proven.

---

[a] Jordan, David Starr, and Evermann, Barton Warren: American food and game fishes, p. 19. (Doubleday, Page & Co., New York, 1902.)

[b] Loc. cit., p. 32.

[c] Letter in Bull. U. S. Fish Commission vol. II, 1882, p. 76–79.

MARKET FISHERIES.

STATISTICS.

Early statistics are so scattered and irregular in form, and even those covering any one of the recent years pertain to such a limited section of the country in that year, that it is difficult to make satisfactory comparisons to show the extent and growth of the market fisheries for catfish. Furthermore, no statistics are available for any section of the country covering a later date than 1905. Therefore figures for different sections for different terms of years must be used to demonstrate the extent, growth, and commercial importance of the fisheries, and these consequently convey only an approximate indication of the present conditions.

For many years the fishery for catfishes has been of considerable importance in certain previously mentioned sections of the country. The last census reports show that more catfish are caught and the value of the fishery greater than ever before. But both of these conditions are due to more extensive fishing, which in turn is accounted for by a greater demand and a wider market. A scrutiny of the figures for the sections of the country in which were located the principal fisheries of former years (the Great Lakes, the Gulf States, and the Middle Atlantic States) reveals that there is an actual falling off in their catch, the more recently established fisheries, in places that were formerly not extensively fished, accounting for the general increase. An exception is apparent in the South Atlantic States, but this probably "proves the rule," as the fishery has increased in extent in those states. There has been a great increase in prices per pound received by both fishermen and dealers in recent years.

Great Lakes.—Statistics of the fisheries of the Great Lakes in 1885 show 90,600 pounds of catfish and bullheads handled at South Chicago, for which the fishermen received $764, an average price by the pound of less than 1 cent (0.84). The dealers are said to have received $1,118, or an average price by the pound of about 1¼ cents (1.24).

In 1890 the catch of the Great Lakes amounted to 2,596,458 pounds, for which the fishermen received $64,402, representing a price by the pound of nearly 2½ cents (2.48). In 1903 the catch for the same waters is reported as 687,723 pounds, yielding to the fishermen $25,847, or a pound value of 3¾ cents. There is thus shown a gain of about 1¼ cents for each pound of fish, but a total loss of $38,555.

Gulf States.—In the Gulf States, exclusive of Florida and Alabama, the statistics show that in 1897 the fishery yielded 2,318,245 pounds, valued at $45,932, to the fishermen, averaging nearly 2 cents (1.9) by the pound. In the same states in 1902 the catch amounted to

2,188,765 pounds, with a value of $67,480, or an average price by the pound of a little over 3 cents (3.08). There is thus shown a falling off of 129,480 pounds in the catch, but the total value shows an increased gain to the fishermen of $21,548.

The statistics of the Gulf States, including Florida and Alabama, for 1897, give a total catch of 2,448,564 pounds, valued at $58,147, and for 1902 for the same states, 2,415,315 pounds, valued at $72,991. These figures show a decrease of 33,249 pounds, but an increase in value of $14,844 and an increase of nearly ⅔ cent (0.65) by the pound.

South Atlantic States.—For this region, exclusive of Florida, the catch of 1887 is reported as 106,059 pounds, representing a value to the fishermen of $2,844, or an average price by the pound of a little over 2⅔ cents (2.68). In 1902 the catch in the same states is found to be 693,650 pounds, valued at $18,824, or an average of a little less than 2¾ cents (2.71) by the pound. These figures indicate an increase of 587,591 pounds and in value $15,980, without any great increase in the price by the pound. In the South Atlantic States, including Florida, there appears to have been from 1887 a steady growth of the fishery, a steadily increasing catch, and a corresponding increase in total value, but some fluctuation of the price by the pound.

STATISTICS OF THE CATFISH FISHERY IN THE SOUTH ATLANTIC STATES, INCLUDING FLORIDA, FOR CERTAIN YEARS.

Year.	Pounds.	Value.	Average price per pound.
			Cents.
1888	116,126	$2,957	2.54
1889	409,794	14,591	3.56
1890	471,208	15,209	3.22
1897	502,311	11,635	2.31
1902	1,310,392	30,976	2.27

Middle Atlantic States.—The statistics for the Middle Atlantic States, exclusive of Virginia, show that in 1887 the fishery yielded 1,746,136 pounds, worth to the fishermen $65,208, or an average price of nearly 3¾ cents (3.73) by the pound, and in 1904 a catch of 866,561 pounds, valued at $40,756, or nearly 4¾ cents (4.70) a pound. There is here shown a falling off of 877,575 pounds and a decrease of total value to the fishermen of $24,452, but an increase of nearly a cent (0.97) by the pound.

The available data for the Middle Atlantic States, including Virginia, go back only to 1890 and represent only four years. These four years show some fluctuations in amount and value of catch, as well as in price by the pound, but upon the whole a decrease in amount and total value, and an increase in price by the pound, as shown by the table on the following page.

Statistics of the Catfish Fishery in the Middle Atlantic States for Certain Years.

Year.	Pounds.	Value.	Average price per pound.
			Cents.
1890	2,758,711	$100,253	3.63
1897	1,535,899	59,538	3.87
1901	2,063,584	77,396	3.65
1904	1,422,886	62,676	4.40

Interior waters.—The catfish fisheries in the lesser interior waters seem not to have been thoroughly canvassed prior to 1895. The data gathered in 1895 and 1896 covers 19 states for the year 1894. The states are Alabama, Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Nebraska, New York, Ohio, South Dakota, Tennessee, Vermont, West Virginia, and Wisconsin. The total quantity marketed was 14,726,812 pounds, valued at $532,972 to the fishermen, or an average of nearly $3\frac{3}{5}$ cents (3.63) a pound.

The next comprehensive canvass was for the year 1899, when New York and Vermont were omitted. The total quantity that year is given as 7,648,179 pounds, with a value of $339,800, about $4\frac{2}{5}$ cents (4.42) by the pound.

For the purpose of comparison New York and Vermont are here omitted from the 1894 data and the figures for the remaining 17 states give 14,576,545 pounds as the whole quantity marketed and $526,194 as the total value, which indicates an average price by the pound of $3\frac{3}{5}$ cents. There is thus shown in five years in those 17 states a falling off in amount of 6,928,366 pounds marketed, and $186,394 in value, but a gain of less than a cent (0.7) in the pound price. For only 11 of these states are sufficient recent data available to furnish a basis of comparison with the conditions in 1908. They are Alabama, Arkansas, Illinois, Indiana, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, and Wisconsin. The catches of these states in 1899 aggregate 6,316,403 pounds, valued at $280,-455, or nearly $4\frac{1}{2}$ cents (4.45) a pound. The yield of the same states in 1908, according to the preliminary reports of the census office, was 10,775,400 pounds, representing a value of $459,830, or about $4\frac{1}{4}$ cents (4.26) a pound. These figures show that in nine years there was an increase of 4,458,997 pounds of marketed catfish, with a gain of $179,375 to the fishermen, but a decrease in the price by the pound of nearly $\frac{1}{5}$ of a cent (0.19).

Summary.—The latest figures of the Bureau of Fisheries, of dates varying from 1902 to 1905 for the different sections of the country, give a total catch of catfish, including bullheads, as 12,718,003

pounds, with a value of $531,529 and a price by the pound of nearly 4⅕ cents (4.18). The census returns for 1908 give for the United States, exclusive of Alaska (where there are no catfish), 18,386,900 pounds, valued at $792,830, which indicates an average price by the pound of nearly 4⅓ cents (4.31). These figures indicate an increased catch since the last previous figures for the respective sections of 5,667,897 pounds, with an increased value of $26,130 and an increase of price by the pound of only about ⅛ of a cent (0.13). The calculations, however, are for obvious reasons not entirely satisfactory.

FISHERY METHODS.

The principal methods of the catfish fishery vary somewhat in the different localities owing to the difference in the conditions. It is doubtless a fact that the catches of some of the apparatus credited with catfish in many of the states are incidental, as suggested by the great disparity in the quantity. But from the statistics it is not possible in every instance to decide which, if any, are used exclusively or principally for catfish. It is reasonable, however, to assume that the apparatus that takes the largest amount is the principal one employed.

Great Lakes.—The fishery in the Great Lakes varies more or less in its methods in the different lakes. According to the report of the Commissioner of Fisheries for 1903, the small fishery in Lake Superior was by fyke nets only. In Lake Michigan pound nets, fyke nets, and seines were used. In Lake Huron pound nets, trap nets, gill nets, fyke nets, seines, and lines were employed. The largest catch was by pound nets, and was nearly twice that of the next in order, the trap nets. The smallest catch was by seines. In Lake Erie pound nets, trap nets, gill nets, fyke nets, seines, and lines were employed. The largest catch was by pound nets, the lowest by lines.

The line fishery in early years seems to have been, at least locally, more important. The Bureau of Fisheries report upon the Great Lakes in 1885 makes the following statement under the heading of "Catfish hooking around the islands:"

> A large number of men and boys on the islands take catfish with set lines in 15 to 30 feet of water, between June and September, or, in some localities, from May 15 till late in October. Some of them are professional fishermen, while others are farmers living along the coast. There are two varieties of catfish caught, known to the fishermen as blue or black catfish and yellow catfish. The blue species varies in weight from one-half pound to 40 pounds, but generally weighs between 5 and 15 pounds. The yellow fish weigh from 4 to 6 pounds, or, in occasional instances, 8 or 10 pounds. The fishermen consider the yellow variety more palatable than the blue, though they have the same price in the market. The catfish caught in the pound nets in the spring and fall are shipped in the "rough" or undressed state to the dealers, who have them dressed before supplying them to the retail trade; but those taken in summer with hook and line are dressed by the fishermen, though about half of their weight is lost in the process. This species is always in demand and brings a good price.

In Lake Ontario the same apparatus was used as in the other lakes, excepting that no catfish were recorded for gill nets and lines.

Middle Atlantic States.—The most recent available data here, for 1904, show that in New Jersey by far the largest quantity of catfish were taken in seines, although some were taken in pound nets.

In Pennsylvania, while seines and fish baskets were also used, fyke nets yielded the largest catch.

In Delaware, while fairly large catches are recorded for gill nets, pound nets, and seines, the fyke nets far exceed them in amount. The same is the case in Maryland. Here, however, there is recorded a small line catch.

The apparatus listed for Virginia comprises pound nets, seines, lines, gill nets, fyke nets, weirs, and slat traps, of which fyke nets, closely followed by pound nets, were most effective.

South Atlantic States.—In 1902 it was found that gill nets, pound nets, fyke nets, catch wheels, slides, and lines were used in North Carolina, pound nets yielding the largest and lines the smallest catch.

The only apparatus used in South Carolina that appears to have taken any catfish is the seine.

In Georgia catfish were taken by pound nets and lines only, the lines yielding about twice the amount of the other. It is probable that here the line fishery is the special one for catfish, and the pound-net catch more or less incidental.

In east Florida but three methods seem to have been used in the fishery—seines, pound nets, and lines. Here, however, the seine records the greatest catch, followed by the line, the pound net yielding the smallest quantity.

Gulf States.—In this region, according to data for 1902, trap nets took the largest catch in western Florida, only one other method, the line, being employed.

In Alabama trammel nets, seines, and lines are credited with catches of catfish. The first far exceeded the other two together, while in Mississippi the same apparatus was used, but the line fishery more than quadrupled the other two together.

In Mississippi seines, fyke nets, and lines are listed as apparatus that took catfish, of which the line fishery more than fourteen times exceeds the other two combined.

The report on the Mississippi River and its tributaries for 1899 credits catfish to fyke nets, lines, and spears in Indiana, of which fyke nets were the most effective. In Illinois seines, trammel nets, fyke nets, pound nets, set lines, drift lines, hand lines, and traps were listed, of which set lines are credited with the largest catch, closely followed by seines and fyke nets. Kentucky is recorded as using seines, fyke nets, trammel nets, cast nets, dip nets, set lines, hand lines, and drift lines, set lines yielding the largest catch and fyke nets a close second.

Tennessee is listed with seines, fyke nets, trammel nets, lines, and trap nets, of which lines are credited with the largest catch and fyke nets follow closely.

Only three methods—set lines, fyke nets, and wooden traps—are mentioned for Alabama, of which the catch of the latter greatly preponderated.

In Mississippi seines, trammel nets, fyke nets, pound nets, drift lines, and set lines were all credited with catfish, but set lines took more than six times as many as all the others together.

For Louisiana lines, seines, fyke nets, wooden traps, and trammel nets are mentioned. Lines took the largest quantity and fyke nets next.

Evermann[a] gives an interesting account of the methods employed in the catfish industry of the Atchafalaya River in Louisiana.

> The Atchafalaya River is in some respects a peculiar stream. It has its sources in Avoyelles and Point Coupee parishes, near where the Red River joins the Mississippi, and is at all seasons more or less connected with both of those rivers by a number of anastomosing channels and bayous. The Atchafalaya River is, in fact as well as historically, one of the mouths of the Mississippi River, and during the floods which come periodically to that region a vast amount of the surplus water of the Mississippi and Red rivers is carried to the Gulf by the Atchafalaya. * * * There are four species of commercial catfishes handled by the firms at Morgan City and Melville, viz: The blue cat or poisson bleu (*Ictalurus furcatus*), the yellow cat or goujon (*Leptops olivaris*), the eel cat (*Ictalurus anguilla*), and the spotted cat (*Ictalurus punctatus*). * * * All river fishing during the fall and winter is done on the bottom, while all lake fishing is at the surface. During the spring, when the country is flooded, the fish betake themselves to the woods, and the fishing is then carried on chiefly along the edges of the float roads. The old tackle, which had been previously used in rivers and lakes, is now cut up into short lengths and tied as single lines, called brush lines, to the limbs of trees in such a way as to allow the single hooks to hang about 6 inches under the water. Each fisherman ties his lines to the trees along the edges of the float roads, if he can find such territory not already preempted by some one else.

Interior waters.—The Arkansas list of apparatus comprises seines, trammel nets, pound nets, fyke nets, set lines, miscellaneous lines, and dragnets. Set lines are credited with the greatest amount, fyke nets are second, and seines third. Set lines, seines, fyke nets, pound nets, and trammel nets were employed in Iowa, the fyke nets far exceeding the others in the amount of the catch.

Wisconsin is listed with set lines, seines, fyke nets, shut-off nets, and trammel nets. Set lines were here shown to have yielded the largest catch. Trammel nets were credited with an exceedingly small amount.

Seines, trammel nets, fyke nets, pound nets, hand lines, drift lines, trap nets, and baskets comprised the apparatus used in Missouri. Fyke nets were credited with the largest catch, followed by seines.

---

[a] Evermann, B. W.: Report on investigations by the U. S. Fish Commission in Mississippi, Louisiana, and Texas, in 1897. Report U. S. Fish Commission, 1898, p. 290.

In Minnesota hand lines, set lines, seines, fyke nets, pound nets, and trammel nets were used. Set lines, closely followed by hand lines, far exceeded the others in amount of catch.

In South Dakota the catch of set lines, with fyke nets as a close second, greatly exceeded the others in amount.

In Nebraska set lines exceed the others in catch. The fyke net is not far behind. The yield of the other two, i. e., seines and trammel nets, are far below them.

In Kansas seines, fyke nets, set lines, and trammel nets were used. Set lines were the most effective, fyke nets next; the others far behind.

CULTIVATION OF CATFISHES.

In the work of the Bureau of Fisheries the best results in catfish culture have been obtained with the bullhead, or horned pout (*Ameiurus nebulosus*), called also yellow cat in some localities. This species lends itself readily to pond culture, and is being successfully produced at stations in the Southern States devoted to the basses and other pond fishes. A manuscript report by Mr. J. J. Stranahan, superintendent of the United States Fisheries station at Cold Springs, Ga., containing observations regarding the breeding habits of the bullhead and the methods of cultivating this fish at that station, is printed in full herewith.

NOTES ON CATFISH AND CATFISH CULTURE AT COLD SPRINGS, GA.

By J. J. Stranahan.

Realizing that there is a growing interest in the catfish among the planters of the South and that the combination of bream and catfish is the best for ponds of small area, especially for those who want the fish for food rather than for show or sport, the writer determined early in the season to make a study of the breeding habits of the marbled catfish, *A. nebulosus*, the species hatched at this station, with a view of producing them in greater numbers than has been possible in the past.

So far as our experience goes, and it has extended over twenty-five years in both the North and South, there is but one species of catfish that is really desirable for pond culture, especially if the area of water is restricted, and that is *A. nebulosus*, or what is usually known as the bullhead or horned pout and marble catfish in the North (although all of the small catfishes are called bullheads in the North) and speckled catfish in the South. All attempts, so far as we know, to domesticate and successfully rear the channel cat (*Ictalurus punctatus*) in small areas of water have utterly failed.

The people of the whole country, and especially of the central South, regard the catfishes favorably, and the interest in them is surely growing. This being true, it follows that an effort should be made to produce them in greater numbers than has been done in the past.

After observing results for several years it seems clear to us that the catfish under consideration (*A. nebulosus*) does better in wild ponds, even of small area, than in those that have been established with much care and pains.

It has been noted at this station, especially in pond M, where conditions are favorable, that the catfish like some such cover as a sunken log or stump. Accordingly it was

determined to place sunken boards in the ponds where these fish are kept, in such numbers that each individual fish should have a home of his own as well as a nesting place. The water in the ponds was drawn to near the bottom and inch boards 12 inches wide and 5 or 6 feet long were used, one end being driven into the embankment a few inches, the other end being fastened to the bottom by driving a 1 by 3 inch stake down at the end and nailing through this into the board. In most cases this left an opening under the center of the board, but where it did not the catfish very soon dug out the earth and made the place to suit themselves. In fact, the writer would recommend that this feature be left to the fish, for it was observed that they dug out the earth and occupied these boards, which were flat on the bottom, before they did the ones along the embankments where an opening was all ready for them. We shall also in future use a board about 3 feet long, as that proves ample for the needs of the fish, requires less lumber, and is less in the way during seining operations. The board should also be well tramped down into the mud so that the stakes will not hang the seine, the stake and board being a little below the general level of the bottom of the pond. If put in thus, it might be well to make the beginning of a depression under the board with a shovel or mattock, as otherwise the board might be overlooked by the fish. This, however, is not likely.

I would here make a special note, special because I believe that it is important in the production of bullheads in numbers. Although the fish ordinarily use the boards in spawning, it was noted that early in the season while the water was yet cool they did not use these, but resorted to the shallows of the ponds where the water is about a foot deep and there established their beds, making a depression in the mud and weeds shaped like a track made by a moccasin-covered foot, the depression being about 18 inches long and 6 wide at the broader end. The parent fish, with their heads to the broader end of the depression, here deposit the eggs. We had no boards in water less than 2 feet in depth, but by accident one board was left on the embankment with one end in the pond in about 6 inches of water. This was early occupied by a pair of catfish and a large brood produced.

All this demonstrates that to be most effective a portion of the boards should be in the shallow water for the use of early spawners. It also strongly suggests that the flow of water into the pond should be so regulated as to produce the highest temperatures attainable in the early part of the season. In the morning the supply should be reduced or cut off entirely, while at night, when the water may be warmer than the air, it should be turned on in full supply.

In this connection I would recommend that where practicable water for the supply of catfish ponds would best be taken from some other pond, so that a higher temperature may be maintained, especially early in the season and during periods of low atmospheric temperature. We have about 32 or 33 catfish in each of our ponds K and M, the former being of about twice the area of the latter. K is supplied direct from the springs, M from a 2-inch iron pipe from pond L, one of our largest and warmest ponds. The catfish hatch has been more than double in M what it has been in K and, for all we know, one pond is as favorable for the fish as the other, both having muddy bottoms and an abundance of vegetable growth. We believe that the temperature of the two ponds is responsible for the difference. As soon as the weather grew hot all of the beds were placed under boards in 2 or 3 feet of water and not one in the shallows.

This matter of temperature may account for the unfavorable results some seasons when practically no catfish are hatched in even the wild ponds, and other conditions than temperature may also have a controlling influence. It is probable that muddy water would be unfavorable and even low atmospheric pressure also, fishes being more susceptible to changes of pressure than air-breathing animals.

From the start we have watched the developments in our catfish ponds K and M. The first point of special note is that the fish were seen spawning about a month earlier than usual, although it must be admitted that a much closer watch was kept (daily,

almost hourly) than ever before. It has been suggested that possibly the contentment brought by the homes afforded by the boards may have had some influence in favoring reproduction. At all events our hatch has been more successful than for the past six or seven years, and we know of no other cause to ascribe it to.

Our first surprise was at the short period of incubation of the eggs. Based on temperature and the period of other fishes, the time should have been about 24 to 30 hours, but these catfish eggs hatched in less than 20 hours. How much less we do not know, but every effort to find out positively will be made during the remainder of this season and next. In the two cases observed so far this season we were thwarted in getting the exact time by the fish coming off unexpectedly early in the morning or in the night. The temperature of the water at the beds in both cases under observation was 77½° to 78½° F., varying with the time of day.

The first case closely watched was on May 8, when at 9.30 a. m. a female catfish was seen in a depression, such as previously described, in about 12 inches of water and 3 feet from shore, in fine position for close observation. She was over a quantity of light-orange-colored eggs, forming a gelatinous mass about 4 inches wide and 5 long and apparently three-fourths of an inch thick or deep. They had every appearance of being freshly deposited, the water still being somewhat muddy owing to the digging of the depression. The male was lying some 3 feet away with apparent unconcern. At 7.30 the next morning both fish and eggs were gone from this spot, but lying some 10 feet away was a female with a brood of very small young, the male being near by and the fry inactive, as they invariably are when just hatched. These adult fish had every appearance of the ones observed the day before.

The second and last case observed was a better one than the former for reasons that will be obvious to the reader. On May 13 at 9.30 a. m. the writer discovered a pair of catfish in a depression, as before described, in about 1 foot of water and 6 feet from shore. The fish were lying side by side, about an inch apart and apparently inactive. There were no tremors or other evidence of an orgasm, so apparent in the case of black bass and other fishes in the act of depositing spawn and impregnating it, and there were no eggs visible on the bed, although the mud on the bottom between the fish and at each side of them could be plainly seen. After a little less than an hour, during which, unavoidably, watch was kept for only about fifteen minutes, the male was found off the nest a short distance away and the female in the center of the bed over a bunch of eggs such as is described in the former case. It is regrettable that continual watch was not kept, and a further shortcoming in observation is also to be deplored. At 7.30 the next morning the fish and the eggs were gone and, as in the former case, the female with a brood and the male standing guard were some 10 or 12 feet from the vacated bed. In the former case the writer assumed that the eggs had been deposited a few hours before discovered and that at least 24 hours would be required for hatching. This led in the second case to a reckoning on his part that the eggs would not be hatched when he went on duty at 7.30 a. m., an error which will have to be corrected by further observation. This is the more a pity, as the opportunity was good for determining the exact period of incubation with this fish in a given temperature of water.

It should be stated that this last lot of eggs was watched from time to time during the day and that but little change was noted. Late in the afternoon, almost sundown, it was thought that the egg mass was somewhat darker, especially around the edges.

During these observations we have arrived at the conclusion that the female of this species broods the eggs during incubation and cares for the young after they are hatched, the male remaining near by in either case and acting apparently as a guard. This opinion as to the division of parental duties is based on the fact that it is the larger fish that broods the eggs and cares for the young, the smaller one standing guard and that, without a single exception in our observations of several broods, the smaller, or guard fish, has an ugly wound on the top of his head well back of the eyes, where the teeth of

his antagonist would come when the jaws of the two are locked, head on, in their fights for the possession of the females. This is the opinion of the commercial fishermen at Chautauqua Lake, New York, where many male fish are found locked together, dead or dying, during the breeding season. We have observed no deaths from this cause, and the fact that all fish that we call guards are wounded as described would seem to indicate that they lock and then break away and lock again, thus giving each combatant a chance to have a sore head.

As with the black bass, and doubtless many other fishes, there is as much difference in these female catfish on the point of being good or poor mothers as there is in the case of hens or human beings. One mother will be seen working continually stirring up the mud to procure food for the fry, rounding them up when a portion of the brood wanders away and keeping the school together until they have grown to an inch and a half in length and are as large around as a lead pencil, while another fish, probably of the same age and size, will leave her young to stir up the mud for themselves, allow them to break up into small schools, and finally will abandon them entirely. They then wander about in small bands or are incorporated with some other brood.

Another very interesting feature in the breeding habits of this fish is that schools of about the same age, or, say, within a week of each other, coalesce, all in the pond forming into one school. In ponds K and M there were several early broods in each pond. These remained with their respective parents until they had attained some size and become active in their search for food, when they consolidated into one large school in each pond and so remained until collected for shipment. The ponds were so clear and the black mass of moving fry so easily seen that there was no doubt about the correctness of this observation. The later hatches remained with their parent fish, not joining with the older broods, but subsequently they sought other broods of about their own age, thus again forming another large school.

Some experiments have been made in feeding these small catfish, with a view to holding them in fry ponds, all former attempts in this direction having failed. Well-cooked corn mush thinned down to a gruel was distributed in a narrow line along the margin on one whole side of a pond, and at the termination of the trail a considerable field, say, 8 or 10 feet square, was moderately covered with the feed. The fragmentary schools—those broken up through poor maternity or other causes—would strike these trails, follow them as a hound would follow a rabbit track, and then clean up all of the feed on the field referred to. They also greedily devour finely ground mullet. It is believed by the writer that excellent results may be attained through a judicious system of feeding both the old and young of this species. As the adults are not pugnacious, except the males during breeding season, we believe that 100 adults could easily and successfully be carried in each of our ponds by giving each a board home and supplying them a suitable quantity, with some variety, of proper food—say cut mullet, with liver for a change. These fish are not subject to epidemics, are easily raised in ponds, finding much of their own food, and are easily captured when wanted.

Mr. W. E. Meehan, Commissioner of Fisheries for Pennsylvania, has found (see Transactions of the American Fishery Society, 1908) that for the "white" and "yellow" catfish an ordinary pond 100 feet square or larger will breed the fish. It should have "heavy" hard clay banks so that the fish when ready to spawn may dig a hole in the bank that will not cave in. The water should also be "cloudy." When the little fish have arrived at the "advanced-fry" stage, they leave the nest or hole and begin "rolling," as it is called. The large fish circle round and round and move the fry over the pond in the form of a ball-like mass. When these balls begin to break up, the fry are

gathered by means of a net and put into a vacant pond, where they are fed and held for shipment as fingerlings. According to Mr. Meehan the adults do not require a great flow of water; but in order to keep them healthy they must be liberally fed, not only through summer, fall, and spring, but during the winter. The manner of feeding in the winter is to cut a hole through the ice and sink to within a foot of the bottom a wire basket filled with cut liver. The catfish feed therefrom very readily and emerge in the spring fine and plump and in good condition for spawning.

It is evident from the foregoing notes, and from general experience, that the common bullhead or hornpout is easily bred and reared in small ponds and is the catfish best suited to meet the demands of private pond owners, farmers, and the public generally. A few fish will soon stock a pond, and with a reasonable amount of care and favorable conditions will furnish a supply of excellent food fish for home and even for market purposes.

At the government stations the cultivation of the bullhead, while easily successful, has not been undertaken on a very large scale for lack of sufficient pond space, other branches of the work demanding greater attention. The bullheads hatched have, however, been reared to fingerling size and larger before planting, and the number so produced—13,725 in 1909—may therefore be regarded as considerable. Recommendations now before Congress, if adopted, will provide a new station for the primary purpose of catfish culture.

SPOTTED CATFISH.

With the spotted catfish (*Ictalurus punctatus*), the attempts at pond culture by the United States fishery stations and the state commissions are so far negative. Observations as to the spawning habits of this species have proved difficult to make and are as yet inadequate to afford proper knowledge upon which to proceed. Experiment has shown that the spotted catfish will not thrive in the still, muddy waters that seem to be suited to the bullhead, and such facts as have been gathered regarding its natural history indicate that it requires clearer, moving water. Both the spotted cat and the blue channel cat (*Ictalurus furcatus*) are found in the San Marcos and Blanco rivers, Texas, usually in swift water over gravel or sand shoals, and Mr. John L. Leary, superintendent of the United States Fisheries station at San Marcos, thinks that they probably spawn in those rapid places, though he has never actually observed them on their spawning beds. It would seem that "quick water" is not always necessary, however, for the spotted cat abounds, or did abound a few years ago, in the St. Johns River, Florida, where there are no riffles or rapids whatever. Here the localities where the water

is clear, comparatively cool, and flowing with a steady, moderate current, over sandy or rocky bottom, perhaps afford spawning grounds for the spotted cat. The Bureau is continuing its efforts to learn the facts as to the conditions required by this fish and expects in time to propagate it successfully.

FISH-CULTURAL DISTRIBUTIONS AND RESULTS OF PLANTS.

The greater part of the Government's supply of young catfishes for distribution is derived from overflowed bottoms in the Mississippi basin. Young fish of all kinds are left in the sloughs when the waters have receded, and among these are found spotted cat, black cat, marbled cat, and bullhead, which, with black bass, crappie, perch, and other species, are seined out annually in large quantities by the Bureau of Fisheries and, except those restored to the river, are used to augment the stock of the hatcheries for distribution to applicants. The number of catfishes so collected runs into hundreds of thousands each year, and in 1909, with the young bullheads hatched at the stations, brought the total distributions of catfish to 562,580.

The increasing popularity of the catfishes appears to some extent in the growing number of requests for them received by the Bureau of Fisheries. These requests come from practically every state and territory, but, as already stated, the catfishes are best known and appreciated in the South and Middle West. The following letter, published in the Bulletin of the United States Fish Commission, volume IV, 1884, page 321, may be quoted as showing an early successful attempt to cultivate the "speckled catfish" in Georgia:

> It is naturally a pond fish, and found only in one locality in the South, at least such is my information and observation. That locality is in Flint River, running south and emptying into the Chattahoochee some distance below Columbus, Ga. Many years ago this fish was plentiful, being found only in still water, lagoons, or ponds. The Flint River runs through the Pine Mountain. Not far south or north of the mountain these fish cease to occupy the waters and inhabit only the tributaries to the rivers, including a space of about 50 or 75 miles. Some time since I determined to try to domesticate them, and the effort has resulted in success. * * * They love a pond of clean water and a mud bottom. All the floods that come can not wash them from their home, unless the whole of the pond is carried away. They will not go into running water if they can avoid it. Disturb them and, like a carp, they will sink in the mud and hide. They can be caught conveniently in a gill net, but with great difficulty in a seine. My pond covers 5 acres of land, the largest and best pond in western Georgia. It is a perfect mass of fish, and has been constructed only eleven months. The water is from an inch to 5 feet deep and abounds in vegetation.

In a number of letters in answer to inquiries, recipients of catfish distributed by the Bureau of Fisheries report their experience with and the results of the plants. Those that refer to the "speckled catfish" mean perhaps, in some cases at least, the bullhead (*Ameiurus nebulosus*), which, as Mr. Stranahan has pointed out, is called "speckled catfish" in the South. But the size attained in some

instances by the speckled catfish, according to the report, casts a shadow of doubt over those particular cases. Others undoubtedly refer to the spotted catfish. The most satisfactory results appear to have been reached with the "speckled cat."

It may be of interest to quote from some of these letters.

A letter received February 4, 1907, from Lumpkin, Ga., says regarding fish sent out in 1903 (?):

The fish received was the spotted catfish. They were put in a pond of about 2½ acres and from 1 to 8 feet deep. The fish that survived grew and did well. They did not thrive [multiply?] well on account of turtles. The water was from a clear branch but ran through hilly lands and was constantly muddy on account of rains. I did not give the pond the necessary attention, yet there was a nice lot of fish caught from it. There were in the pond also what is known here as a mud cat, not a very desirable fish. I thought that perhaps they preyed on the others when small. Upon the whole I think they were adapted to the water and would have done better if I had drawn the pond and cleared it of turtles, mud cats, etc. But the pond was a railroad fill, and I could not draw it off. Yet for the chance they had I believe the fish did very well, and had I been able to clean out the pond I could have made it a success.

From Pomona, Ga., regarding fish that were planted in a pond at that place:

I have seen very few of the speckled catfish in the past two years although I have watched for them, and am inclined to think they have been destroyed by black bass. I have caught quite a number of the old ones during the past year, weighing from 1 to 2 pounds.

From Sparta, Ga., a letter received December 2, 1907, replies regarding 1903 (?) fish placed in a pond:

The speckled catfish seem to increase very fast—faster than any other fish in the pond. Am well pleased with them.

An enthusiastic letter dated January 3, 1908, was received from Heard, Ala., regarding fish planted in a pond in that vicinity:

In reply to your inquiry regarding the speckled catfish: There has been a wonderful growth of them and it seems as though my pond is a fine place for them. I have fish to eat all through the fishing season. I have not stocked my pond with any other kinds, but others, such as warmouth perch and mud catfish, have come in.

In 1905 I saw a school of young speckled catfish in my pond, the growth of which was surprising to behold. I feed my fish with bread, scraps of beef, and pulp, and catch them in a basket that I use to feed them in. I caught in one basket at one time 14 pounds of speckled catfish. I am doing everything in my power to get my neighbors to build ponds and raise their own fish at home with a very small cost to them. I consider that my pond has paid me well for time and expense. The bottom of the pond is of moss and sand and there is a pure, never failing stream. In some places the water is 10 feet deep, with lots of moss, grass and cat-tails growing in it.

Another letter from Georgia, dated February 1, 1908, says:

In reply to your inquiry, I beg to say that the speckled catfish received of you in 1902 have succeeded beyond my expectations. I had them placed in a small artificial pond supplied entirely by spring water, and, with virtually no care, they have multiplied rapidly and grown wonderfully under the circumstances.

I consider the speckled catfish by far the best variety of fish for small ponds to be obtained, as they are thrifty growers, with a flavor equal to any.

A letter dated February 11, 1908, from Washington, Ga., states:

In answer to yours of February 2, I state that I am well pleased with the results from planting catfish in Armstrong Pond or Lake. When conditions are favorable we often catch a string of nice fish, a yard or more in length, in a short time. I do not think the speckled cat can be excelled for eating unless by such fish as trout or white perch. * * * I placed 40 or 50 in several small creeks near by and from these streams we now catch, very often, a good supply of speckled catfish, the descendants of the same fish your department sent me. They thrive well here and their introduction is a blessing.

A letter from Atlanta, Ga., dated February 1, 1908, tersely says in part:

Catfish did fine; largest weighed 2¼ pounds; exceedingly prolific; satisfaction perfect; March, 1907, lost dam on account of long continued rains.

From Columbus, Ga., February 1, 1908:

The speckled catfish were placed in my mill pond very successfully in 1903. I watched them with a good deal of interest and had them taken care of. I did not allow any fishing done in the place until last year, but found that it was almost impossible to catch any of the fish although we could see a great many in the pond. Unfortunately about thirty days ago a heavy rain broke my milldam, and I am very much afraid that some of my fish got away; however, I hope not many. * * * These fish were placed in a mill pond the water of which is furnished by a clear creek stream.

Regarding fish planted in his private pond a resident of Fort Deposit, Ala., under date of February 4, 1908, writes:

Replying to your circular letter of December 2, 1907, will say that the fish in my pond have done well. They have increased in numbers and have grown considerably. The pond is of clear pond water coming from wet-weather springs and seep from the soil.

A letter from Americus, Ga., received February 4, 1908, expresses satisfaction with the fish sent, saying, in part:

I consider the fish a success. They did well and increased very fast.

From Lizella, Ga., in a letter dated February 5, 1908, regarding "spotted" catfish placed in a mill pond:

As to the spotted catfish, they did fine. I think I have caught several of 3 pounds weight each.

The following letters relate to catfish planted during the fiscal year of 1904.

From Sunnyside, Ga., in a letter dated January 18, 1909:

The speckled catfish that were planted in Malaires pond grew nicely until large enough to bite a hook, then most of them were caught by negroes who fish the pond incessantly with hooks. While of course there are, we suppose, a few left we do not know how many. I have planted no other fish in this pond. I think that several years previous to this plant some one else planted black bass and it is my opinion that these bass destroyed a lot of these catfish.

A letter from Columbus, Ga., dated January 18, 1909, says:

With reference to speckled catfish in Lake Mahignac, I beg to advise that the results were very good. We are catching some of them with hook and line that will weigh from 3 to 4 pounds, others smaller.

Lexington, Ky., January 23, 1909:

The fish sent me grew very well. The third year they ran from 3 to 5 pounds. They never increased [in numbers] that we know of. * * * I think the spotted catfish is better adapted to running streams. We find plenty of them in Kentucky River. I also think they do well in reservoirs.

Regarding a consignment of "speckled catfish" planted in private fish ponds, a letter from The Rock, Ga., received January 22, 1909, states:

The speckled catfish were planted on arrival. They spawned the next season and hatched all right, but do not seem to grow and thrive as they should. It may be that they are not fed on the right kind of food. They are fed usually on cooked corn bread. If they need other food, I do not know what it is.

From Alva, Okla., under date of January 27, 1909:

The fish planted in Little Driftwood Lake in 1903 have multiplied until now there are great numbers of them. Three and a half pounds is the largest we have taken out. I also have many sunfish, blue cat, and bullhead cat. This lake supplies us with all the fish we want. We allow many of our neighbors to fish with rod and line, as the fish seem to increase faster than we can use them.

From Hampton, Ga., January 30, 1909:

We put the catfish in a pond with just ordinary branch-water supply. They did well and have made quite an increase, at least quite a number have been caught annually from the pond and still it is well supplied with the same kind of fish.

A note written on the returned circular of inquiry, from Walnut Cove, N. C., January 30, 1909, regarding the fish planted in a farm pond, states that the old fish are about 18 inches long and that there have been young fish for the past two years.

A note dated February 13, 1909, regarding fish planted in Lake Pippin, near Akron, Ohio, states they thrived and multiplied greatly, and that it can be said without fear of contradiction that there is not a nicer body of water or a better stocked lake within the state.

INTRODUCTION OF CATFISH INTO PACIFIC STATES.

Dr. H. M. Smith has exhaustively covered this subject up to 1895.[a] He states that three species of catfish—the white catfish (*Ameiurus catus*), the yellow catfish or bullhead (*Ameiurus nebulosus*), and the spotted catfish (*Ictalurus punctatus*)—inhabiting parts of the United States east of the Rocky Mountains, have been transplanted to the Pacific States. The first introduction was in 1874 and consisted of

---

[a] Smith, H. M.: A review of the history and results of the attempts to acclimatize fish and other water animals in the Pacific States. Bull. U. S. Fish Commission, vol. xv, 1895 (1896), p. 379–472.

56 large Schuylkill catfish (*Ameiurus catus*) from the Raritan River, New Jersey, and 70 hornpouts or bullheads (*A. nebulosus*) from Lake Champlain, Vermont. The first were deposited in the San Joaquin River, near Stockton, Cal., and the bullheads were placed in ponds and sloughs near Sutterville, Sacramento County, Cal. Other consignments of a few spotted catfish have since been sent to California, amounting in all to 510. From the waters thus stocked by the United States Fish Commission the California Fish Commission distributed the various catfishes widely in that state.

In 1877 the State Fish Commissioner of Nevada transferred from the Sacramento River a large number of the "Schuylkill cat" (*Ameiurus catus*), and with these and their progeny as a basis of supply, the fish were widely distributed in Nevada waters.

Up to 1908, 710 catfish had been sent to Oregon and 2,175 to Washington. It is evident that they found these new waters peculiarly suited to them, as they multiplied prodigiously and grew rapidly. It was not long after the first plants were made that a catfish fishery was inaugurated. Smith says:

> The practice of taking these fish for market from public waters has probably increased from year to year, although no statistics are available for any early years. At present it is probable that more catfish are caught for local and home consumption than for sale in the large marketing centers, but no accurate idea of the extent of the desultory and semiprofessional fishing can be formed.
>
> The catfish fishery is not of large proportions in either California or Oregon. Only a small amount of capital is invested in it, but few persons are regularly engaged, and the catch is insignificant compared with the yield of many other fish taken in the same waters. The industry is more extensive in California than in Oregon.
>
> The commercial fishery, in California at least, has probably reached its height, if it is not already on the decline. The receipts of catfish by the San Francisco dealers in 1894 were nearly 30 per cent less than in 1893; the decrease was due wholly to the lack of demand, the fish being more abundant.

The estimated amount of catfish caught in California in 1893 totaled 200,000 pounds, making a gross value of the fish to the state of $8,500. (Smith, p. 391.)

Regarding the catfish trade, Smith goes on to say:

> The principal marketing centers for catfish are San Francisco, Sacramento, Stockton, and Portland. The last-named place has the most extensive trade. In proportion to its population, San Francisco receives much fewer catfish than any of the other cities mentioned.
>
> Catfish can not be said to be common in the San Francisco markets. The demand is usually very limited. At times, however, when other fish are scarce, they meet with ready sale at good prices. In 1893 the average daily receipts were less than 150 pounds, and in 1894 under 100 pounds. In no month during those two years did the daily receipts run over 250 pounds on an average, and in July and August, 1894, they were under 30 pounds a day.

The total quantity handled by San Francisco dealers in 1893 was 43,974 pounds; in 1894 it dropped to 31,055 pounds. Smith further

states that the price commanded by catfish in the San Francisco market has greatly decreased in the past few years. In 1888, the average price to consumers was 17 cents a pound; in 1889, it was 10 cents; in 1891, 7 cents; in 1892, 6 cents; and in 1893, 4 cents.

The quantity of catfish handled in Portland, Oreg., in 1893 was 75,000 pounds of dressed fish, with a retail value of $3,750.

STATISTICS OF THE CATFISH FISHERY IN THE PACIFIC STATES FOR CERTAIN YEARS.

[From statistical reports of the U. S. Bureau of Fisheries.]

Year.	Pounds.	Value.	Average price per pound.
California:			Cents.
1895	276,605	$3,965	1.43
1899	465,911	12,734	2.73
1904	737,144	20,992	2.71
Oregon:			
1895	99,399	1,347	1.35
1899	54,360	1,087	1.90
1904	180,000	6,000	3.33
Washington:			
1899	105,700	2,114	2
1904	6,000	300	5

Smith says:

The quantity of catfish taken for sale in the Columbia basin in 1893 was about 90,000 pounds, with a value to the fishermen of $2,800. Comparatively large numbers were also consumed by lumbermen, farmers, and others who fished for their own use.

The receipts of catfish in Portland in 1893 amounted to 75,000 pounds.

The contention of the California fish commissioners, in several of their reports, that the value of all the catfish caught annually and consumed as food would more than equal the annual appropriation made by the state in the interest of the fisheries and fish culture has probably been verified in a number of years. In 1893, when the fishery is known to have been less extensive than formerly, the appropriation exceeded the value of the catch by only $1,500.

The last census office preliminary reports give the total catch of catfish in the Pacific States as 1,269,800 pounds, worth $64,810, or an average price by the pound of about 5 cents (5.1).

According to Smith, fyke nets and set lines or trot lines are the apparatus chiefly employed for taking catfish. Both of these appliances are used in California, but in Oregon only the fyke nets are used. Considerable quantities are taken in some localities in drag seines. In the semiprofessional fishing, hand lines and dip nets are also employed.

INTRODUCTION OF CATFISH INTO FOREIGN WATERS.

General attempts have been made to provide some European waters with American catfish. A number of years ago, at different times, small consignments of *Ameiurus nebulosus* were sent to Europe. They survived transportation very well and the last

accessible records show that they continued to do well after reaching their destinations. What the ultimate results have been the writer has been unable to ascertain.

Available records of shipments of young catfish (*Ameiurus nebulosus* and later *Ictalurus punctatus*) to Europe afford the following data:

November 15, 1884.—One hundred were shipped to Ghent, and on November 28, 95 were received.

July 7, 1885.—Thirty sent to Amsterdam.

June 16, 1885.—Fifty shipped, and later 49 were received in Germany.

July 18, 1885.—One hundred sent to France, and 81 were received in good condition.

June 20, 1885.—Fifty consigned to England, and 48 were received in good condition at South Kensington.

1892.—Five hundred and two sent to Belgium.

1892.—Seventy-six shipped to Germany.

1903.—Four hundred sent to Belgium.

The most of the information possessed by the writer regarding any of these plants is found in early bulletins of the Fish Commission. The following is quoted from the bulletin for 1886, volume VI, pages 197–199:

The first practical attempt in this direction was made in Belgium. Mr. Thomas Wilson, United States consul at Ghent, first suggested placing catfish in the Scheldt, a river which, owing to the large number of factories on its banks, does not contain many fish. It was presumed that the catfish would be particularly adapted to the river Scheldt, because it had been sufficiently proved in America that this fish is not much affected by the refuse from factories. After consulting with Prof. Spencer F. Baird 100 young catfish arrived at Antwerp in November, 1884. By the advice of Professor Baird these young catfish were not immediately placed in the river, but first in the large basins of the large aquarium. It is only after these fish have reached maturity in the aquarium and have spawned there that the young generation should be transferred to the river. This was done, and the young catfish received from America have provisionally been placed partly in a small pond in the botanical garden at Ghent and partly in the Victoria Regia basin in the same garden. The selection of the last place we do not consider fortunate, as the temperature of the water in this basin is certainly much too high for these fish. At present there are in the Amsterdam aquarium 45 catfish, brought direct from New York and placed in a special basin with the hope that they will reach maturity and propagate their species. At present these fish measure from 4 to 6 inches long.

In the same bulletin, on page 138, appears the following, by Dr. Jousset de Bellesme, on the American catfish in the Trocadero Aquarium of Paris:

These fish, which measured 12 centimeters (about 4¾ inches) in length, were, in the beginning, owing to their small size, placed in one of the tanks for young fish in the aquarium and remained there till November, 1885, when they were put in the large basin, No. 6.

They were first fed with raw meat, but as they did not seem to take very well to this kind of food they were fed on raw fish chopped fine, which they appeared to like. As soon as they were transferred to the large basin they were fed on live fish.

The water at the disposal of the aquarium is that which comes from the Vanne, whose temperature is 15° C. (59° F.) in August and 9° C. (48.2° F.) in December. It is hardly probable that this temperature is sufficiently high for the reproduction of the catfish. At any rate, those which we have in our aquarium, no matter to what variety they belong, have never spawned.

When the American catfish were transferred to basin No. 6, they were all alive and well, although they had not grown perceptibly. Since that time none of them have died, as far as we have been able to observe, for these fish have a habit of keeping in their holes and never coming out during the day, so that they are hardly ever seen. In basin No. 1 we had some of considerable size, and in order to assure ourselves of their existence it became necessary to empty the basin and carefully search for them at the bottom between the rocks. Even then we did not always succeed in finding them. I have, therefore, reason to believe that seven catfish which the Acclimatization Society has given us are still in existence, and the first time the basin is emptied I will search for them again in order to make sure.

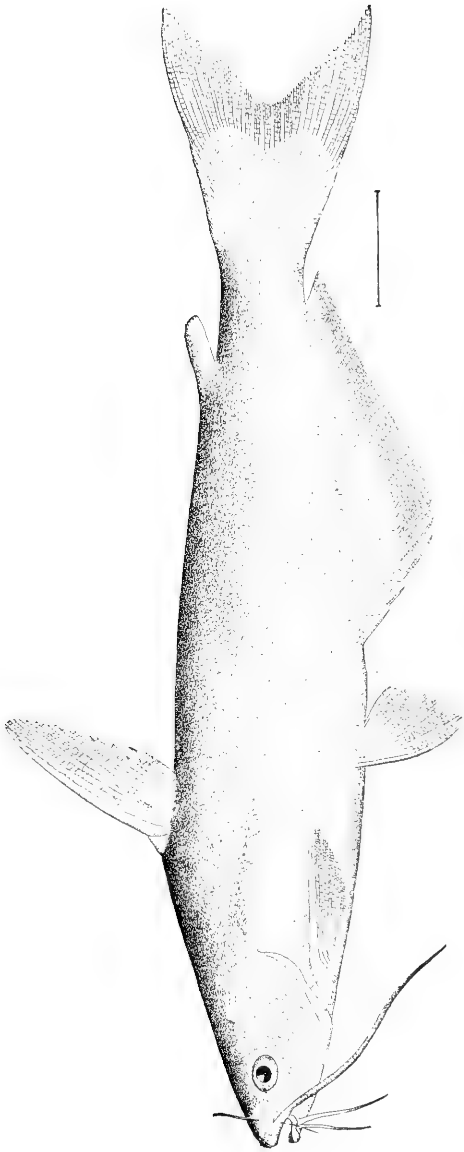
The latest information regarding the European introduction is found in a little work entitled "Der amerikanische Zwergwels (Small Cat-fish) und der Fleckenwels (Spotted Cat-fish) in Deutschland," by Max von dem Born-Beneuchen, published in 1891. On page 7 the author states that in the summer of 1885 the committee of the German Fisheries Society received from Prof. Spencer F. Baird in Washington 50 young catfish, which were turned over to his care, and that they were placed in a pond with muddy bottom where there was a great deal of "Wasserpest" and a depth of about 2 meters. They have done very well and increased. Since those brought from America and those held in other fish hatcheries have increased so prolifically, he believes that the small catfish can now be regarded an acclimated fish.

Von dem Born-Beneuchen goes on to say that from 1887 to 1890 he had reared 2,225 one-summer old (*einsömmerige*) small catfish; 300 were placed in a lake, 10 breeders and 665 one-summer old fish were given to other fish hatcheries and aquariums, and he now possesses 325 small catfish, for the most part mature (*laichfähig*). On page 8 he continues:

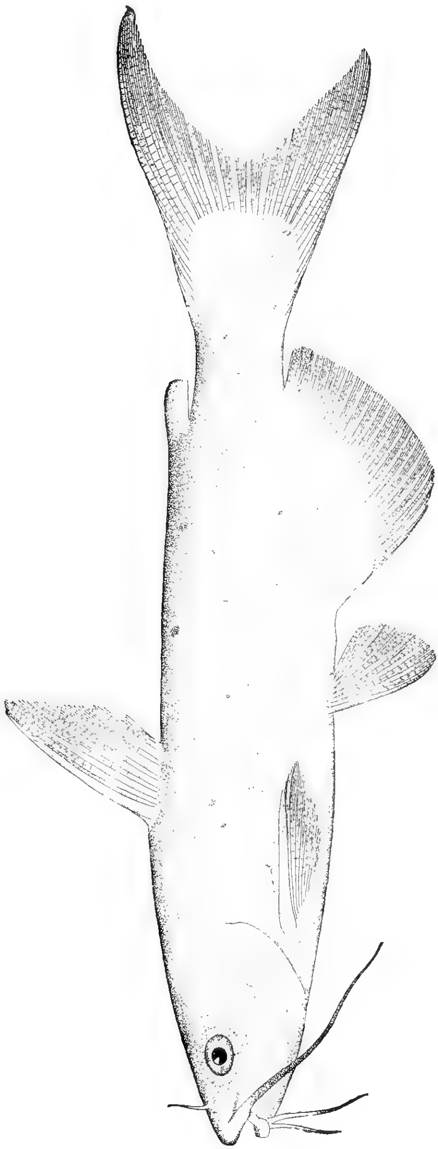
Mr. Fred Mather sent me from the United States Fishery Commission in December, 1888, a quantity of spotted catfish from the Ohio River. Of these, 18 arrived at Beneuchen in good condition, and in February, 1891, 16 fish still lived. They have not yet spawned, although they are already mature in 1890.

○

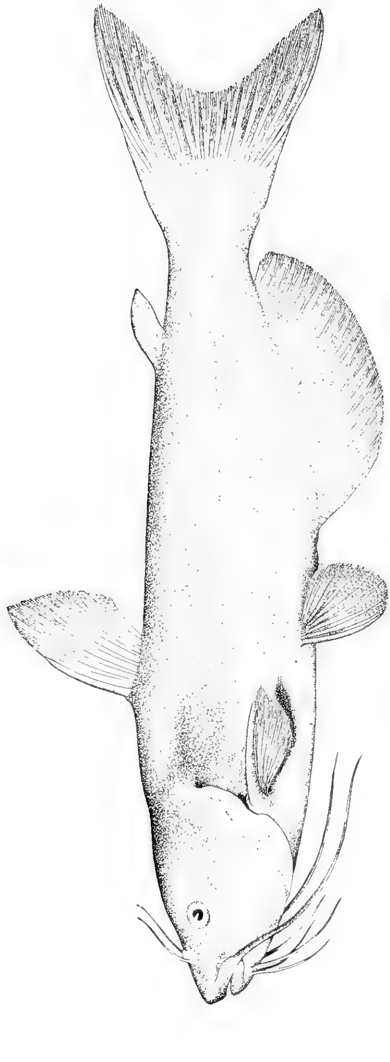
PLATE II.



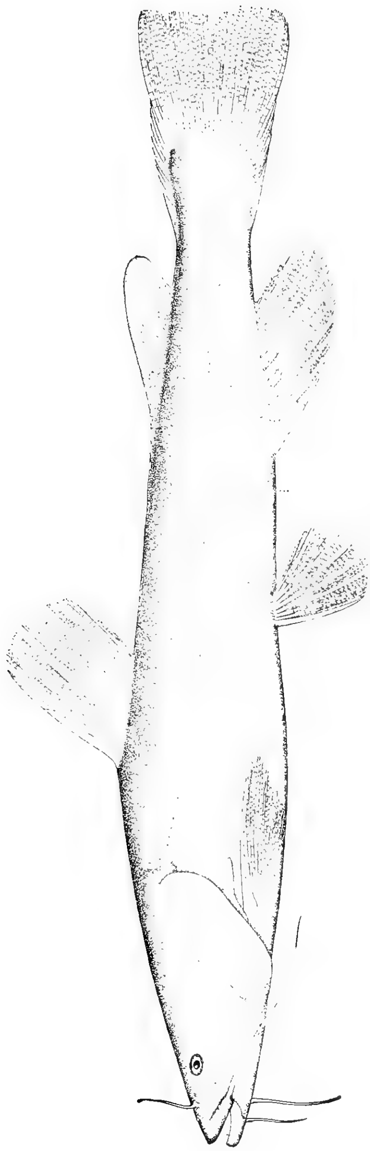
GREAT FORK-TAILED CAT (*Ictalurus furcatus*).



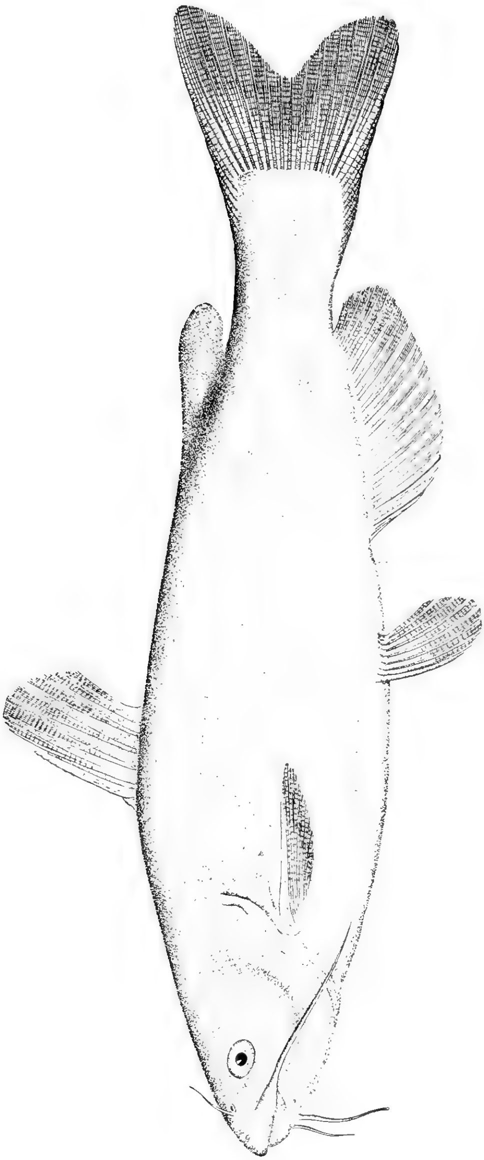
SPOTTED CAT (*Ictalurus punctatus*).



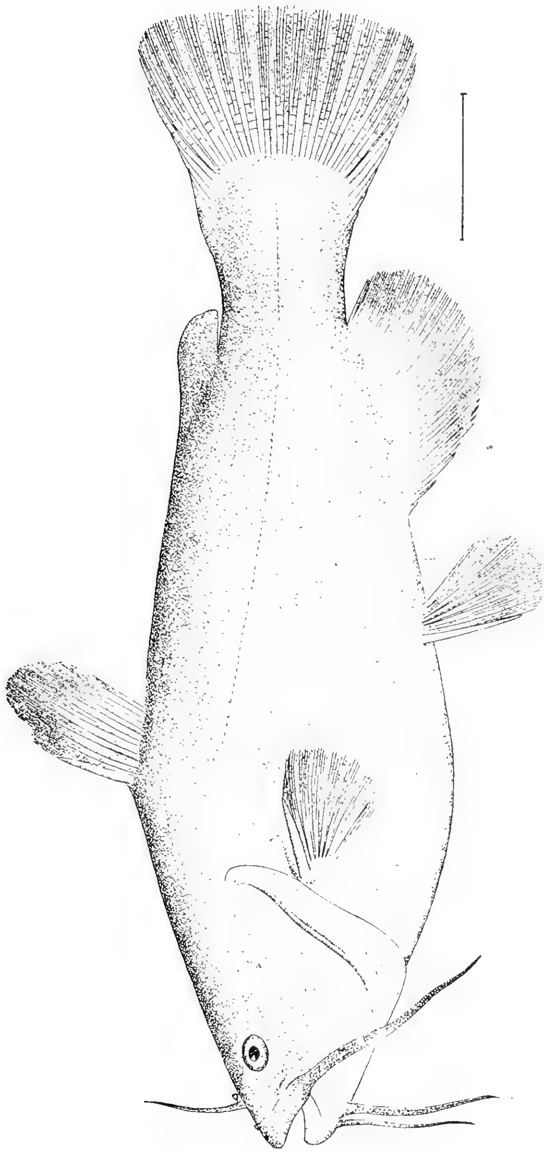
EEL CAT (*Ictalurus anguilla*)



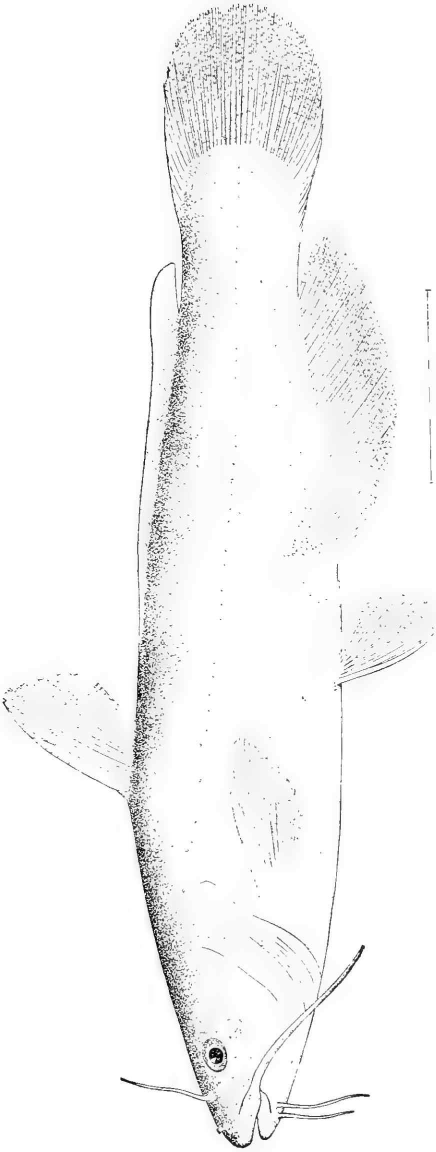
YELLOW CAT. (*Leptops olivaris*).



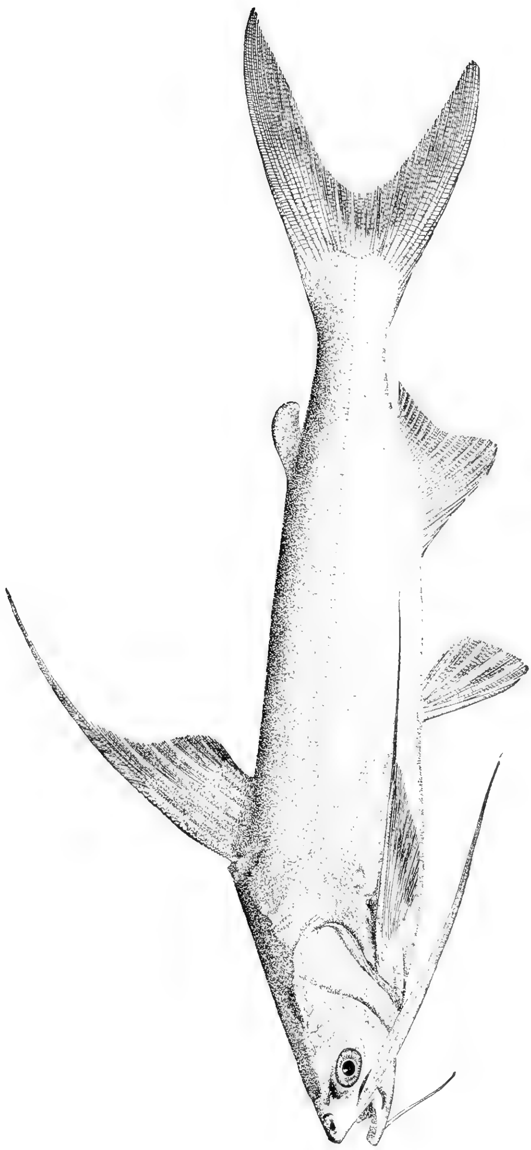
POTOMAC CHANNEL CAT, OR WHITE CATFISH (*Ameiurus catus*).



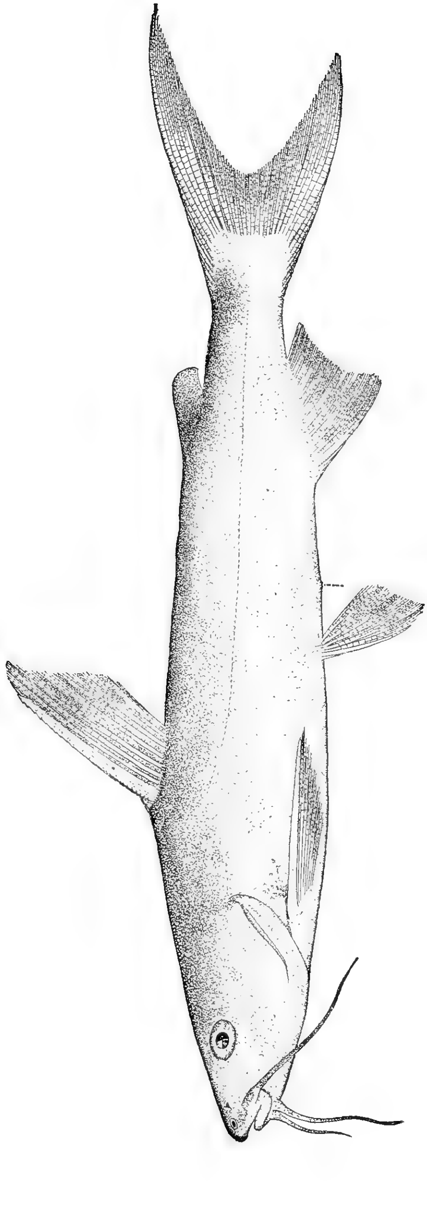
BLACK BULLHEAD (*Ameiurus melas*).



YELLOW BULLHEAD (*Ameiurus natalis*).



GAFF-TOPSAIL CAT (*Felichthys marinus*).



SEA CATFISH (*Galeichthys milberti*).